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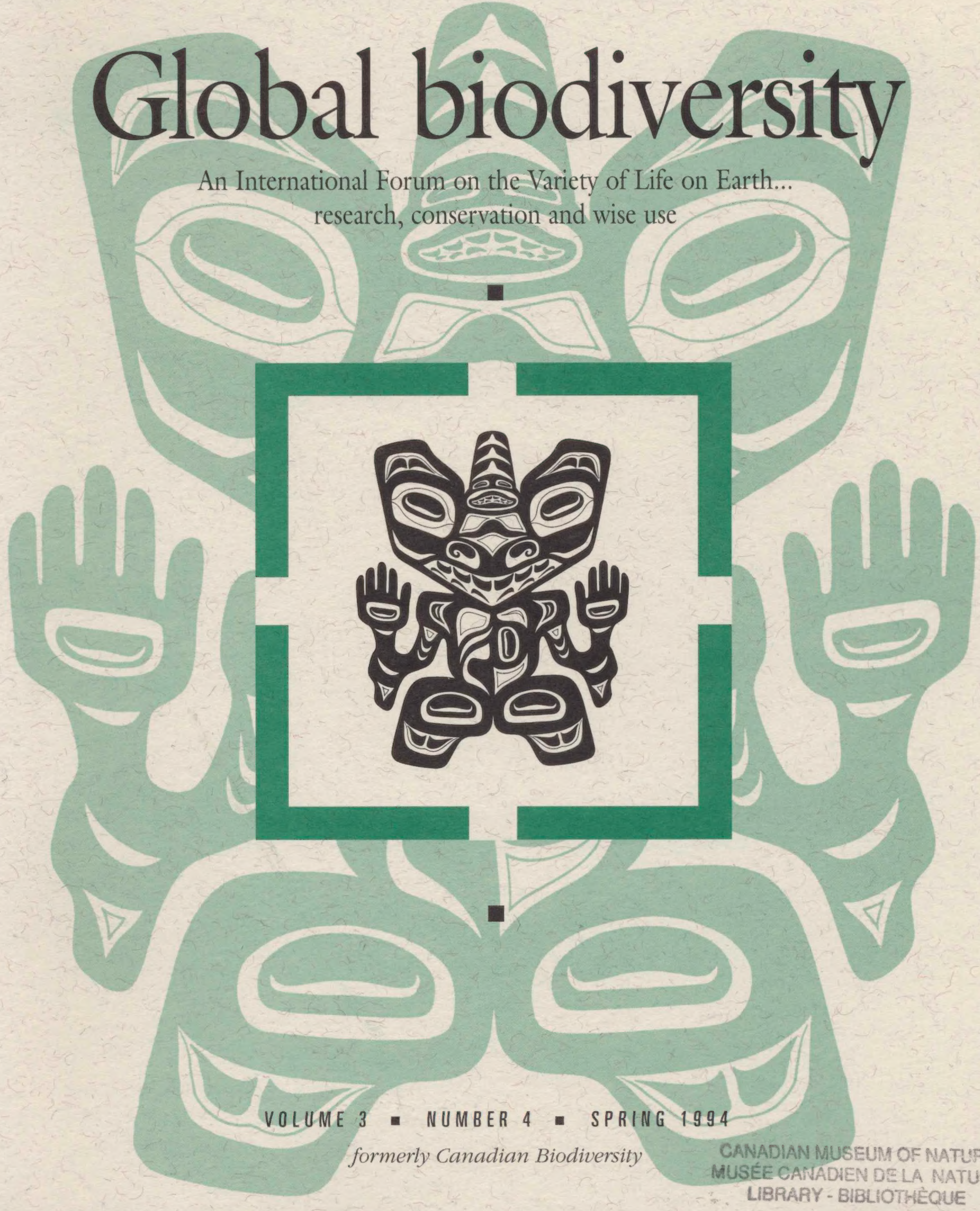
Global biodiversity

An International Forum on the Variety of Life on Earth...
research, conservation and wise use



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Editor's Notebook

1993 was the **International Year of Indigenous Peoples**. In this issue we are honoured to present the *Indigenous Peoples' Statement to the Intergovernmental Committee on the Convention of Biological Diversity.*

Traditional ecological knowledge or TEK is the wisdom of indigenous peoples created, tested, and accumulated about the plants, animals, microorganisms, and ecosystems that occur in their homelands. This knowledge is far older than modern science, which is only about two centuries old. That means that much of TEK has stood the test of time. TEK knowledge is derived from a year-round experience of nature in contrast to that of science, which largely derives from work during the academic summer break. The roots of TEK knowledge are deeply imbedded in the life and seasonal rhythms of the land and waters in which it developed. And unlike science, which tries to be neutral, TEK incorporates attitudes and feelings about nature. TEK tends to be holistic, while science tends to be reductionist.

While the bodies of traditional ecological and scientific knowledge are not identical, there is often overlap and close agreement in parts of these bodies of knowledge. There may be close agreement, for example, in the species of birds recognized by indigenous peoples and scientists. In other cases, what indigenous peoples know about species and varieties of plants are not yet recognized by science. The indigenous knowledge of plant uses in a given area is often greater than that of botanists and pharmacologists. Ethnobotanists are still learning from the encyclopedic knowledge of elders.

TEK, however, is not free of error any more than science has been. Nor will it be easy for non-indigenous people to understand indigenous peoples. Non-indigenous people, particularly with a materialistic market-driven outlook, will have to listen and try hard to understand. Undoubtedly TEK *is* a precious body of human knowledge about nature, and the First Peoples that hold TEK deserve respect. And it means that the ties between indigenous peoples and the land they dwell in should be preserved, that they should retain sovereign rights over that land. This and future issues of *Global biodiversity* will contain articles written by indigenous people. I hope you will enjoy and learn from them.

Don E. McAllister

Don E. McAllister
Editor

The goals of Global biodiversity are to:

- *Publish articles, views and news on biodiversity*
- *Bridge the gaps between professional disciplines & the public*
- *Communicate vital information to help humankind make decisions on the fate of the Earth's life*
- *Express views on the needs & value of biodiversity research*
- *Provide an international forum for discussing issues on biodiversity*
- *Enhance awareness of the role of biosystematic research & museum collections to conservation & ecologically sustainable use of biodiversity*
- *Discuss methods and philosophy of biodiversity conservation*
- *Review books and major articles on biodiversity*

News, views, articles for publication and books or papers for review should be sent to:

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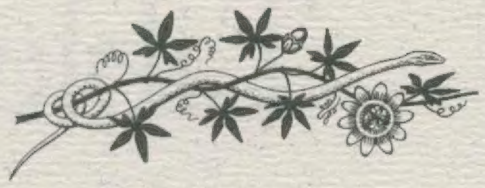

Indigenous Peoples' statement

to the Intergovernmental Committee on the Convention on Biological Diversity

Statement on behalf of:
The Asian Indigenous Women's Network; Asociacion de Derecho Ambiental de la Region Inka, Peru; Congreso General Guaymí, Panama; Cultural Conservancy, USA; Cultural Survival, Canada; Sobrevivencias, Paraguay; South and Mesoamerican Indian Information Center, USA; and Gabriel Muyuy, Indian Senador of the Republic of Colombia.

Presented 14th October 1993, Geneva, Switzerland

Chairperson, Distinguished Delegates:

On behalf of the Indigenous Peoples' Caucus, I would like to thank you for giving us this chance to express our perspectives on the Convention.

We, Indigenous Peoples of the world, are the sole guardians of vast, little-disturbed habitats that modern societies depend on more than they realize—to regulate water cycles, maintain the stability of climate, and provide valuable plants, animals, and genes. Our homelands harbour more endangered plant and animal species than all the world's nature reserves. We possess ecological knowledge of incalculable value, which is a map of the biological diversity of the Earth on which all life depends. Encoded in our cultures there is as much understanding of nature as is stored in the libraries of modern science.

Biological diversity and cultural diversity depend on one another. We, Indigenous Peoples, are not only stewards of biodiversity but our biodiverse cultures have fostered it. The richest ecosystems, and biological and genetic diversity are usually found within our ancestral territories. At the same time, we depend on this diversity for our way of life. Thus, conserving this diversity is inextricably linked to the protection of our rights.

It was little appreciated in the past centuries of exploitation but is undeniable now that the world's dominant culture cannot sustain the Earth without our aid. The planet's worsening health demonstrates the failure of the conventional development paradigm. The world needs new paradigms based on conservation practices such as those we have been practising for millennia.

The convention recognizes in its preamble and Article 8, paragraph j, the importance of our knowledge, innovations, and practices for the conservation and sustainable use of biological diversity. Article 10, paragraph c, states that governments shall protect and encourage customary uses of biological resources in accordance with traditional cultural practices that are sustainable. Furthermore, the Convention provides that the benefits deriving from our knowledge should be shared equitably.

Unfortunately, these principles are rarely honoured in reality. Our traditional practices are discouraged and forbidden, often by use of force. The exploitation of biodiversity using our traditional knowledge, without our consent, helps produce billions of dollars a year for others, but not for us. We ask that the Parties to the Convention ensure that these provisions of the Convention are fully enforced.

Recently, the exploitation of our diversity has extended even to the bodies of Indigenous Peoples themselves. In one particularly shocking case, the United States government has applied for the patenting of the genetic material from a sister of the Guaymí people of Panama, without the knowledge or permission of her or her family. We call on the governments signing the Convention to ensure that no genetic resources are taken from those to whom they belong. Moreover, we strongly oppose any form of life patenting.

Alongside of this novel of exploitation, the classic violations of our rights continue, violations supported by international institutions such as the World Bank, as well as by governments. Our rights to our lands, our resources, our languages, our cultures, our own forms of government, and our civil and political rights are constantly abused. If biodiversity is to be protected, these abuses must cease. We appeal to you to recognize the rights of the many Indigenous Peoples, such as the Ainu of Japan, the Jumma of Bangladesh, Yanomani of Venezuela and Brazil, Pehuenche of Chile, Penan of Malaysia, and all others whom we do not have the time to mention.

Often these abuses, which are destroying our lands and cultures, are inflicted in the name of economic development that is supposed to help people. The Chico River dam project in the Philippines, the James Bay project in northern Quebec, and the Captai hydroelectric dam in the Chittagong-Hill-Tracts of Bangladesh, are just a few of the thousands of these projects.

In conclusion, we urge the governments convened here to take the following specific actions:

- To implement the Convention's requirements that governments respect, protect, and encourage sustainable traditions of resource use. For instance, the Parties could establish a panel to hear complaints of violations of this requirement, such as the government bans on indigenous traditions of crop cultivation. Such bans are causing the disappearance of indigenous seeds and plants, and are damaging indigenous societies in many places.
- To establish the Indigenous Peoples' Division, staffed by indigenous people, in the Secretariat, to ensure that their views are included in the implementation of the Convention.

We also urge you to work on these general tasks:

- To facilitate implementation of traditional knowledge for biodiversity protection.
- To incorporate the indigenous perspective on property, ownership, and knowledge into issues under the Convention such as intellectual property rights and the sharing of benefits.
- To implement the Convention so as to support Indigenous Peoples' management of our territories and institutions.

Standards for ecologically responsible forest use

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INTRODUCTION

Protecting and maintaining healthy, sustainable human societies, including their economies, requires the protection, maintenance, and sometimes, the restoration of fully functioning ecosystems. Fulfilling these goals means a shift in the paradigms that guide society, from a short-term economic expediency ethic to an ecosystem-based ethic. Ecologically responsible forest use—also called wholistic forest use—is part of an ecosystem-based ethic.

An ecosystem-based ethic recognizes several important principles, which are well-grounded in ecological science:

1. Earth, from microbe to globe, is a whole system, interconnected and interdependent.
2. Earth functions to sustain the whole in an equilibrium that is dynamic, yet (in human time frames) stable.
3. All ecosystem structures have a function. If we lose the structure, we lose the function.
4. People are part of Earth. What we do to Earth, we do to ourselves.
5. Human plans must encompass ecosystem time frames of centuries, not short-term development timetables of one to five years.

Our plans and activities in all landscapes that make up Earth must honour and embody these five principles. Standards for ecologically responsible forest use, be it timber management or ecotourism, are based upon these five principles.

It is vital to apply an ecosystem-based ethic within forests. Earth's forests regulate climate; store, filter, and purify water; purify air; and provide homes for more plants, animals, and microorganisms than any other terrestrial ecosystem. What occurs in the forests of the Earth directly and indirectly impacts all other terrestrial and aquatic ecosystems large and small, short and longterm.

Ecologically responsible forest use applies to a variety of human activities in the forest, from timber extraction and public recreation to adventure tourism and ranching. Summary standards for timber management are described below. These standards are only a small part of a much larger planning system, called Wholistic Forest Use, based on the concepts of ecological responsibility and balanced human and non-human use of the forest.

GENERAL STANDARDS FOR ECOLOGICALLY RESPONSIBLE TIMBER MANAGEMENT

The primary standard for ecologically responsible timber management is:

> All plans and activities must protect, maintain, and restore (where necessary) a fully functioning forest ecosystem at all temporal and spatial scales. Forest composition, structures, and functioning must be maintained, from the largest landscape to the smallest forest community, in both short and long terms.

Two important forest ecosystem concepts are encompassed within this general standard for ecological responsibility: forest landscapes and forest stands.

THE FOREST LANDSCAPE is the large-scale view of a forest. It is a mosaic of interconnected, interdependent stands or patches that are repeated in a pattern across a larger landscape. This pattern has both spatial and temporal components. For purposes of human use, decisions made on the landscape level are those that include watersheds of small (less than 5,000 hectares) to moderate size (5,000 to 50,000 hectares). In regional planning processes, considerations at the landscape level are expanded to watersheds that encompass hundreds of thousands of hectares.

In current planning for many activities, particularly timber management, many humans tend to focus on small forest parcels largely because of limited spatial views, demands for short time frames, and cultural conditioning. Ecologically responsible forest use requires that all planning and activities start at the landscape level. The character and condition of the forest landscape dictate what is ecologically possible at the stand level.

A FOREST STAND refers to a smaller ecosystem where a relatively homogeneous forest unit can be identified. The composition, structure, and ecological functions within a stand are similar enough that an ecological prescription for responsible forest use can be applied uniformly within the stand. Because of the small scale, there should be no changes in the ecological parameters sufficient to produce unexpected or undesirable results.

This applied definition relates the physical size of a stand to the artificial criteria of the plan or assessment being used. In the past, stands have largely been defined by narrow timber characteristics driven by short-term economic variables. However, stands must be defined by the ecosystem factors necessary to maintain fully functioning forests at the landscape level. Conventional timber management and ecologically responsible timber management differ in this respect. The stand size and scale must be determined by ecosystem parameters related to natural disturbance patterns and movement patterns (i.e. energy, nutrients, water, and animals), not by rigid or desired human management criteria.

LANDSCAPE LEVEL STANDARDS AND PLANNING

Landscape planning and standards operate at the broad scale. Because all forest stands are part of a related landscape, forest use planning must start at the landscape level in order to maintain landscape health and functioning. Landscape **characteristics** (the natural spatial and temporal landscape pattern) and **condition** (changes to the landscape as a result of human modifications) will influence what can be done at the stand level. Required landscape level standards for ecologically responsible forest use include 1) developing a protected landscape network, 2) establishing ecologically responsible forest use zones, and 3) developing restoration plan(s) as needed.

Standards for landscape planning operate at the broad scale. Forest use planning must start at the landscape level in order to maintain the full functioning of a healthy ecosystem. Photo: D.E.M.

For purposes of planning human use, the following outline describes the major standards required for ecologically responsible forest use in small and moderate size landscapes:

1. Develop a protected landscape network. Network components include:
    a. Riparian ecosystems, including riparian zones (wet forest area along creeks, rivers, lakes, wetlands, and all water bodies) and the riparian zone of influence (the upland forest immediately adjacent to the riparian zone),
    b Representative stands or ecosystem types (old growth forests are particularly important),
    c. Ecologically sensitive areas, and
    d. Cross valley corridors.

(Note: In a regional planning process—i.e. for large landscapes of about 100,000 hectares and more—large protected reserves of 50,000+ hectares must be included in the protected landscape network.)

2. Establish ecologically responsible forest use zones within the framework provided by the protected landscape network. Within these zones, ecologically responsible human use can take place. Important zone types include:
    a. Cultural areas (culturally or historically important to local people),
    b. Ecologically sensitive areas,
    c. Fish and wildlife habitat,

Roads are the focuses of active erosion processes. Ecologically responsible forest use minimizes the impacts and numbers of roads and thus, protects the soil. Photo: D.E.M.

d. Recreation, tourism, or wilderness areas, and
e. Wholistic timber management areas.

3. Develop restoration plans as required.

STAND LEVEL STANDARDS AND PLANNING

The stand level is the scale to which humans can most easily relate. Human plans for modification generally focus on the **visible** stand level, but let us not forget that these plans have effects on both the stand level at the **invisible** or microscopic scales as well as on landscape levels. The following standards are the major ones required at the stand level for wholistic timber management. Note that these standards apply only where the larger planning system has been followed and where timber management has been determined to be an appropriate and ecologically responsible forest use:

1. Protect and maintain composition and structures to support fully functioning forests at all scales. Specific plans to achieve this standard will—
   a. Protect existing large snags and fallen trees.
   b. Permit a **minimum** of 20 to 30% of large over-story trees (well distributed spatially and by species) to grow old and die, in order to ensure an ongoing supply of old trees, snags, and fallen trees. *In most cases, wholistic timber management will require maintaining a greater portion of large over-story trees throughout a forest cycle.*

2. Use ecological rotation periods—for example, 150-250+ years.

3. Prohibit clear-cutting as currently practised and instead use ecologically appropriate partial-cutting methods that maintain the canopy structure, age distribution, and species mixtures found in healthy, natural forests in a particular ecosystem type.

4. Prohibit slash burning.

5 Maintain or restore fire where necessary for ecosystem functioning,

6. Allow the forest to regenerate trees through seeds from trees in the logged areas. In general, tree planting will not be required because a diverse, fully functioning forest is always maintained.

7. Maintain ecological succession to protect biological diversity. The practice of "brush" control (by herbicides or brush cutting) will therefore be avoided.

8. Prohibit pesticide use.

9. Minimize soil degradation by minimizing the width, disruption to drainage, and frequency of necessary roads, including skid roads, and avoiding use of roads (including skid roads) wherever possible.

10. Protect the water by protecting riparian ecosystems, minimizing impacts on drainage patterns, and deactivating old roads (including skid roads) to reestablish dispersed water movement patterns.

RESTORATION STANDARDS

As with other forms of ecologically responsible stewardship, we must learn, in the process of restoration, to solve problems with finesse and ingenuity, rather than with force. Soft approaches that protect all the parts of the ecosystem must be used rather than aggressive approaches that label some parts as valuable and other parts as worthless or harmful. Careful restoration includes five important principles:

1. Restore the forest at the stand level while making sure that these activities rebuild landscape connections.
2. Mimic historical ecological processes.
3. Restore whole watersheds and large landscapes.
4. Prepare restoration plans and carry out restoration activities with local people, ideally those who inhabit the forest.
5. Treat the causes of degradation, not just the symptoms.

People experienced in agricultural restoration have found that degrading land use activities have often been designed by specialists and accomplished by powerful technologies, such as large machines and pesticides. In contrast, effective restoration requires all kinds of people with all kinds of skills. People with shovels will be as important as people with machines. Restoration must be more than a swift afterthought or hopeful solution to a single problem, no matter how commendable the impulse.

Some of the important activities that might comprise an adequate restoration plan include:

- the restoration of soil health, which would include breaking up compacted soil surfaces and introducing vegetation to stabilize soil, build soil nutrient levels, and restore water- holding capacity,
- the establishment of natural drainage patterns,
- the encouragement of natural diversity by natural reseeding (instead of replanting) of naturally occurring tree species,
- the planting of trees and shrubs where required for stabilization and diversification of a degraded forest community,
- the careful reintroduction of animal and micro-organism species,
- the restoration of riparian zones by re-establishing streamside vegetation,
- the stabilization of stream banks and diversification of stream channels by reintroducing large logs (until naturally fallen large trees are available), and
- the careful reintroduction of natural and human-induced fire by limiting the practice of fire suppression to specified areas (near human dwellings and in wholistic timber management zones).

CONCLUSION

Ecologically responsible forest use must begin from the humble understanding that the forest is an interconnected web that focuses on sustaining the whole, not on the production of any one part or commodity. All of the standards summarized in this paper—protecting and maintaining composition, structure, and functioning; respecting biological limits; and limiting the scale of our activities—apply to every kind of human use, whether we are building a wilderness lodge, grazing cattle, or cutting timber. Ecologically responsible forest use practices accept the control of natural process and mimic the subtlety, diversity, and unpredictability of natural changes. Ultimately this approach focuses on what to leave, not on what to take, and the goal is to leave behind a fully functioning forest on all levels.

Of all the components of the forest web, humans are the only ones we know to be completely optional. The forest sustains us, we do not sustain the forest.

ADDITIONAL READING

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Earth, from microbe to globe, is a whole system, interconnected and interdependent. The flow of rain to the river is moderated by foliage and absorption by the forest floor duff (leaves and twigs) and then moves into the soil through pores made by soil organisms. Finally it seeps, purified, into forest streams, free of sediment.
Photo: D.E.M.

■ ■ ■

Dinosaurs through 175 million years

Based on text given at a talk to the Canadian astronauts, 20 November 1992

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The kaleidoscope of life gives the impression that the evolution of shape, size, and function is random. Dr. Russell's article, using 175 million years of dinosaur evolution as an example, shows that there are common threads and patterns in the evolution of the web of life. He develops a number of ideas including what trends are found in evolution, why were dinosaurs so big, and what would happen if we really did revive the dinosaurs today?

[D.E.M.]

SOME PRELIMINARY CONCEPTS

Today's living animals often resemble dinosaurs, suggesting that natural selection tends to recreate certain body forms. A flavour of the archaic about dinosaurs also implies that improvements have occurred through geological time. Might trends in evolution render ancient ecosystems, if revived, less "fit" than modern ones? A few conceptual tools may be useful in considering this question.

Time is both insubstantial and undirected, and the effects of large amounts of time are not easy to measure. Photographs of Earth from space reveal detail that was unimaginable to Columbus, and our comprehension of ancient ecosystems is surely as incomplete as his was of geography.

Lines of descent appear to branch randomly, and some researchers have thereby concluded that evolution is a chaotic process. However, living things have become more complex through time, which suggests that some order in evolution does exist. This *trend* was noticed by students of the history of life even before Darwin, but has largely remained unquantified.

Many features of the anatomy and behaviour of living animals are correlated with body weight. Thus reptiles weighing 100 kilograms (kg) typically eat 3.3 kg of flesh per week; we therefore presume extinct reptiles of the same weight to have eaten as much. Dinosaurs probably obeyed the rules of **ecological uniformitarianism**, which conform to the Lyellian principle that the present is a key to the past.

THE PLACE OF DINOSAURS IN THE HISTORY OF LIFE

In the absence of evidence to the contrary, astronomers often assume that a single astronomical object is typical of its kind. Our sun is indeed an average star, and Earth might also be considered an average life-bearing planet. Was there an "average" period in the history of life on Earth? Perhaps, one could divide the 3.8 billion years during which life is known to have been present on our planet by half to reach life's midpoint. But 1.9 billion years ago, the highest life forms were nucleated single-celled algae. In terms of biological complexity, algae may not quite be up to average, although there are several phyla of "algae" (green, yellow-green, golden, etc.)! Perhaps some sort of mathematical transformation of the variables is warranted.

Organisms respond according to the logarithm of the stimulus (Fechner's Law) rather than in a straight line relationship. Logarithmic transformations of stimuli include decibels (hearing) and magnitude (light). Do

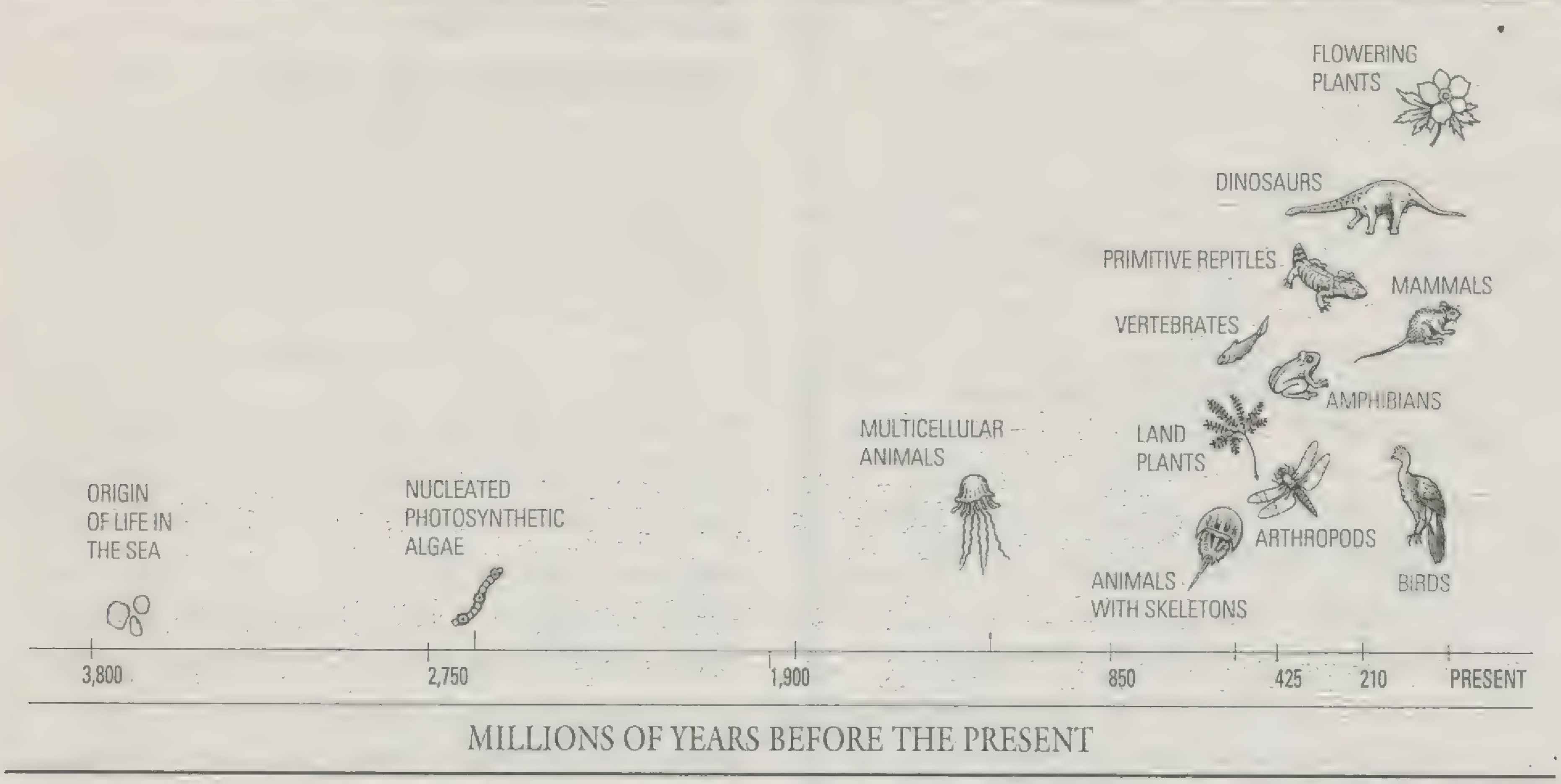


Figure 1.
The distribution of some significant evolutionary events in time measured in millions of years before the present.

organisms react to time in a non-linear way? This seems to be confirmed in the slow pace of organic change on primitive Earth and the rush of evolutionary events toward the present (Figure 1). In an exponential relationship the rate of change accelerates with time. Underlying this relationship is the fact that each new species provides habitat, food, or some other support for additional species. The converse may also be true, that as various stresses drive species to extinction other species may disappear with them.

One exponential trend is a more or less steady increase in the variety of living things over time:

$$\text{Number of species} = e^{0.023*t}$$

In this and the following equations "e" is the base of natural logarithms, and "t" is time in millions of years since the beginning of the trend. Life presumably began with a single species and there are now about 10 million species living on our planet. This trend predicts that half of the modern number of species were present during the middle part of the dinosaurian era. Were dinosaurs the "average" inhabitants of Earth?

WHY WERE DINOSAURS SO BIG?

Appearing 240 million years ago, ancestral dinosaurs were bipeds the size of small dogs. The energy costs of bipedal and quadrupedal locomotion are nearly identical, and there have never been as many different kinds of bipedal, land-dwelling creatures on Earth as during the dinosaurian era. The economics of balancing the food budget tend to favour the largest body size consistent with avoiding starvation (see box on next page). Big animals are simply more efficient, and an increase in size permits an animal to feed on lower quality food usually available in greater abundance. Limits to body size are probably not set by the force of gravity, but by the rate at which food can be consumed. For example, the daily food requirements of a 6 tonne, warm-blooded elephant (116 kg of fodder) would also nourish a 56 tonne cold-blooded sauropod (brontosaur). The latter would be a very large sauropod, although larger ones are known. Both animals would spend most of their time feeding.

Because of their very low growth rates (indicated by growth rings in their bones) and their ancestry among crocodilelike reptiles, primitive dinosaurs probably had low metabolic rates. However, because many later dinosaurs had very rapid growth rates (indicated by the size-mortality structure of herds killed in floods or mud slides) and large tooth area to weight ratios, they probably also had relatively high (sub-mammalian) metabolic rates. If the trend toward higher metabolic rates was exponential it may be approximated by:

$$\text{Metabolic needs (kcal/kg/day)} = 3.29e^{0.019*t}$$

The equation reflects how metabolic rates increased as

Some economies of large body size

-The metabolic cost of maintaining the body is proportional to weight raised to the 0.77 power, so that per kg savings in metabolic costs increase with weight;

-The cost of transportation is proportional to weight raised to the 0.72 power, so that per kg savings in transportation costs increase with weight;

-The cost of growth is proportional to weight raised to the minus 0.29 power, so that the per kg savings in the cost of growth sharply increase with weight;

-The cost of reproduction, if represented by a single egg is proportional to weight to the 0.59 power, and if represented by the number of eggs, is proportional to weight raised to the minus 0.44 power, so that the overall per kg savings in the cost of reproduction dramatically increase with weight.

-But the weight of the skeleton is proportional to weight raised to the 1.09 power, so that the real economies resulting from large body size are offset to a small extent by the costs of maintaining and transporting a larger skeleton. (*cf. Russell 1980*)

weights declined through the dinosaurian era. If dinosaurs were like mobile light bulbs, they would have been large, slow moving, and dull red early in their evolution, while the later light bulbs would have been smaller, more rapidly moving, and bright yellow. The number of light bulbs per unit area would have remained about the same.

Primitive dinosaurs had the brain-body proportions of crocodiles. Later in their history many had larger brains, and some were proportionately as large as those of chickens and opossums. The trend was similar in animals that lived both before and after the dinosaurian era, and is approximately described by:

$$\text{Brain, corrected for body size} = 0.001e^{0.0134}$$

Increase in brain size has thus become more rapid with time. In general, being large was not good (selectively advantageous) enough, either for dinosaurs or for animals in general. In the long term, large animals become smaller because their probability of survival is enhanced by higher activity levels (higher metabolic rates) and greater behaviourial repertoires (larger brains). Both trends appear to accelerate through time.

HOW MANY KINDS OF DINOSAURS WERE THERE?

About 285 major varieties (genera) of dinosaurs have been named so far, and more remain undiscovered. The approximate relationship between land area and number of dinosaurian genera as of 75 million years ago is:

Number of genera = 0.1319(Area in km2)0.36

The number of different kinds of dinosaurs present in a given area increases less rapidly than does area. Data from several ancient lands of different ages indicates that the proportionality constant (0.1319 in the above equation) changes with time (it increases). With the help of data from continental drift and the average duration of a dinosaurian genus (7 million years), the number of major different kinds of dinosaurs that have ever existed can be estimated as at least 3,400. Thus only 8% of the major varieties of dinosaurs that once existed on our planet are known.

Dinosaurs come in many, quasi-familiar shapes. There are examples of parallel evolution: Ceratopsian rhinos, Ornithomimid ostriches, Euoplocephalid glyptodonts (giant armadillos). There are ancient shapes that resemble combinations: Hadrosaurids (cow ostriches), Dicraeosaurs (elephant lizards [cf. back frill and ears]), Dromaeosaurs (eagle wolves), and Therizinosaurs (emu giraffes). And there are modern shapes that resemble combinations: Cows (hadrosaurid ceratopsids), Elephants (brontosaur ceratopsids), Wolves (tyrannosaurian baryonychids), Giraffes (therizinosaurid ceratopsids), and Humans (pachycephalosaurian caenagnathids).

From the point of view of adaptation, these similarities represent "signals" in the evolution of large land animals. Anatomical detail represents "noise," which specialists study very carefully in order to discover natural relationships. (From the point of view of deciphering evolutionary trees, the reverse is true.) Comparable similarities and detail could be expected in large land-dwelling animals of other Earthlike planets.

JURASSIC PARK

The achievements of the dinosaurian era are impressive. Dinosaurs achieved high activity levels associated with incipient warm bloodedness. Backboned animals attained the ability to fly. Rapidly growing, flowering plants appeared and spread across the continents. Swimming, air-breathing reptiles and highly maneuverable, suctionbiting fishes proliferated in the oceans. However, major trends in the history of life have since produced changes that would profoundly challenge the dinosaurs if they were to appear in today's world. Modern plants would seem to them to be protected by a formidable array of spines, toxins, and symbiotic insects. Their old, simple, open fern velds and forests have been replaced by grasslands and dense forests. Most would be anatomically and intellectually unequipped to eat fruits and grasses, which had not yet evolved during the dinosaurian era.

The change in land animals would also be astonishing. There is now a much greater variety of mammals, and nearly all are smaller than dinosaurs and quadrupedal instead of bipedal. Average brain-body proportions have tripled since the end of the dinosaurian era, and activity levels have increased as well. The skies are filled with an enormous variety of equally hyperactive and intelligent birds. Ants, wasps, and bees are more common and probably more aggressive. Animals, whether mammal, bird, or insect, would seem like frenetic little fuzz-balls with savage, voracious appetites. Their curiosity and tenaciousness would render them enervatingly annoying. Unremittingly social and vocal, they emit a cacophony of grunts, howls, and songs. Gender differences might seem exaggerated, and the task of parenting exceedingly onerous.

The increase in average brain size of land-dwelling animals is of great significance. Because the physical environment has not changed greatly since the end of the dinosaurian era, the increase in information necessary for survival (and which is processed in the central nervous system) must relate to the perceived complexity of the biological environment. This implies that the increase in biological complexity on Earth, which has been sustained for enormous spans of time, is driven by inter-organismal competition, and that selection pressures have increased in step with increases in biological complexity.

For example, Australia is a relatively small continent and has been isolated for about 60 million years. In keeping with biodiversity size-of-area relationships, the number of different kinds of backboned animals living on Australia has never been large. Selective pressures also appear to have been less, for the metabolic rates of Australian mammals, which are mostly marsupials, are relatively low (averaging 70% of those of mammals living on larger continents); and their brains are relatively small (averaging 60% of those of mammals living on larger continents). As a consequence, the mammalian fauna of Australia is vulnerable to invasions of foreign mammals, such as rats, rabbits, dogs, and humans, in part because they are not used to competing in as complex a world as the invaders. The response of Australia's marsupials to exotic higher mammals provides some clues to evaluate the events in Michael Crichton's novel *Jurassic Park*.

So, how realistic are the premises of *Jurassic Park*? Here dinosaurs are cloned from DNA strands preserved in the guts of blood-sucking insects, in turn preserved in ancient amber. The dinosaurs are then introduced to an island off the coast of Central America, but they escape to the mainland and threaten modern creatures, including man, with extinction. Could dinosaurs really cause extinctions in today's world?

The modern world has benefited from 65 million more years of natural selection than the dinosaurian world. If the living ecosystems of Tsavo Park in southern Kenya were introduced onto a Jurassic continent, they would so effectively outclass native Jurassic ecosystems that the dinosaurs would probably be decimated (if not exterminated) within a few decades. In the reverse situation, that of *Jurassic Park*, dinosaurs would be profoundly out of sync with modern life, and could only survive in zoos. Even there they would be menaced by modern diseases.

THE MEANING OF DINOSAURS

Paradoxically, the evolution and extinction of the dinosaurs are currently being linked to Earth's environment in space. Evidence of a cometary impact when the dinosaurs became extinct 65 million years ago is stimulating investigations of the environmental effects of cometary impacts. The proverbial "dimness of wit" of dinosaurs provides an interesting link in a trend in brain evolution of interest in the radiotelescopic Search for Extraterrestrial Intelligence (SETI).

The dinosaurs apparently became extinct because atmospheric pollution from a cometary impact temporarily prevented green plants from growing. However, the food chain based on decaying plant material was not badly damaged, so that fungi, insects, and insectivorous birds and mammals survived. The birds and mammals thus replaced the dinosaurs as players in a great evolutionary drama, and the drama itself continued. Dinosaurs had previously given rise to birds, and thereby ultimately to parrots. Parrots are

Corythosaurus

Triceratops

Daspletosaurus

Camarasaurus

The border art illustrates the great variety of evolutionary shapes as found in the dinosaurs.

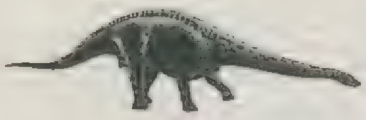
small, have high metabolic rates, and very large brains. These attributes represent the current expression of selective pressures that have long been operative in dinosaurian evolution. Even though mammals were derived from another group of reptiles (therapsids) and appeared on Earth about the same time as did the dinosaurs, similar selective pressures have operated on mammals. We are the result. We are biologically special only in that we represent the most complex evolutionary expression of Earth's biosphere, and have the power to diminish, extinguish, or conserve the rest of the family of life.

The trends linking dinosaurian and modern biota provide obvious insights into the future evolution of life on Earth (it seems certain that the trends will continue), and into the evolution of life on Earthlike planets elsewhere in space. With respect to dinosaurs, it can be anticipated that this evolution would include a period during which the dominant animals are giants with low metabolic rates and small brains. However, *Tyrannosaurus rex*, in all its genetic and anatomical detail, was as much a product of planet Earth as was Lassie. Similarly, a period during which the dominant animals are relatively smaller, and possess higher metabolic rates and humanlike brain-body proportions, would also be expected in the evolution of extraterrestrial multicellular organisms. But, just as *Tyrannosaurus rex* and Lassie are inexorably linked to the biosphere Earth, *Homo sapiens*, in all its genetic and anatomical detail, can include only sons and daughters of Earth.

Talarurus

Dromiceiomimus

Deinonychus



Apatosaurus

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After Rio:
Biodiversity Conservation in Canada

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INTRODUCTION

At the United Nations Conference on Environment and Development held in Rio de Janeiro in June 1992, Canada was the first country to sign the Convention on Biological Diversity (Prescott, 1992). An outline of this Convention and its importance and consequences for Canada are presented below.

THE CONVENTION ON BIOLOGICAL DIVERSITY

Cornerstone of the Rio Conference, this agreement contains 42 articles and 2 annexes that are the end result of a process started in 1987 by the World Conservation Union (IUCN). After convincing the United Nations Environment Programme (UNEP) of the need of such a convention, both joined forces with the World Resources Institute (WRI) in 1989 to launch an international effort to develop a strategy for the conservation of biological diversity. Of the 85 concrete measures proposed in that strategy, published in 1992, the following five are of particular strategic importance (Miller, 1992):

1. Achieve and implement a Convention on the Conservation of Biological Diversity.
2. Call on the United Nations to establish an International Decade on Biodiversity.
3. Establish a widely representative International Panel on Biodiversity Conservation.
4. Establish an early warning system, a global network linking universities, NGOs, and communities to provide "alerts" on the status of species, genetic resources, and ecosystems.
5. Prepare national strategies, policies, and plans for the conservation and sustainable use of biological diversity.

The Convention on Biological Diversity is, therefore, the key element of a global strategy. It has three objectives: the conservation of biological diversity, the sustainable use of Earth's biological resources, and the fair and equitable sharing of the benefits arising from the use of the world's genetic resources. In particular it recommends appropriate access to genetic resources and the transfer of relevant technologies, taking into account all rights over those resources and technologies. It also recommends appropriate funding to allow developing countries to implement the measures necessary to fulfil the obligations of the Convention. In fact, it aims to enhance living species and protect them in order that they may be fairly and sustainably used.

The importance of the Convention on Biological Diversity lies in its numerous implications, namely:

It recognizes the need to protect biological diversity for the benefit of present and future generations.

It commits every signatory State to adopt a national strategy to conserve its biological diversity, to identify its biological resources, and to monitor their development.

It protects the right of ownership and the sovereignty of the States as far as the use of their own biological resources is concerned.

It recommends an increase in international aid.

It advocates technology transfer between the countries that transform resources and those that produce them.

It advocates protection of ecosystems and natural habitats through the development of a system of protected areas.

It recommends the establishment of facilities for ex-situ conservation of and research on living organisms.

It advocates the recognition of traditional knowledge, innovations, and practices relevant to the conservation of biological diversity and the sustainable use of its components.

It stresses the control or eradication of those alien species that threaten ecosystems, habitats, or indigenous species.

It recommends the adoption of social and economic measures to rehabilitate and promote the recovery of threatened species and to reintroduce those species into their natural surroundings.

It advocates the establishment and maintenance of programmes for scientific and technical education and training, as well as the development of educational and public awareness programmes with respect to conservation and sustainable use of biological diversity.

It recommends the adoption of appropriate procedures requiring impact assessment of projects that are likely to have significant adverse effects on biological diversity.

THE CONVENTION ON BIOLOGICAL DIVERSITY: IMPORTANCE AND IMPLICATIONS

Up to date, more than 150 countries including Canada, Japan, the European Union, and most of the developing countries have signed the Convention on Biological Diversity. It came into force on December 29, 1993 after the 30th state ratified it. Having decided not to sign at Rio, on the pretext that the Convention would endanger some of its industries, the United States changed its mind in early 1993. At this point, under a new administration, it yielded to public pressure and realized the extent to which the Convention allies the objectives of conservation and sustainable development.

Canada played a deciding role during the negotiations that led to the signing of the Convention on Biological Diversity. The first country to ratify it, Canada should benefit greatly from this agreement given that a large part of its gross national product comes from the direct use of renewable resources. The fact that the Convention focuses on the whole of biological diversity, not only "wild spaces and species," means that it will have implications for fisheries, forestry, agriculture, education, and trade (Campeau, 1992).

MEANINGFUL MEASURES

Concurrent with the Earth Summit, the Canadian government took several measures in support of the objectives of the Convention on Biological Diversity.

Firstly, it set up the Biodiversity Convention Office, which is responsible for carrying out an inventory of the current biodiversity conservation initiatives and programmes in Canada. The Office is also developing a National Strategy for the Conservation of Biodiversity that should be ready for public review in the spring of 1994. (For more detail on this process, see *Global biodiversity* 3(3):4-5.) This initiative is in addition to the efforts expended by two other Environment Canada programmes: the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the Recovery of Nationally Endangered Wildlife (RENEW). In spite of the important contributions of these programmes to the knowledge base on different species, the species by species approach has turned out to be disappointing from several points of view. The 250 species studied by COSEWIC in the last 15 years are but a drop in the ocean of 8,643 endangered or already extinct Canadian terrestrial, freshwater, and marine species, be they plants, animals, or microorganisms. (cf. Prescott and Aniskowicz, 1992).

Secondly, a Canadian Centre for Biodiversity has been established at the Canadian Museum of Nature in Ottawa. This centre is sustained by museum specialists who provide and enhance knowledge on the diversity of living organisms. The Centre has access to CURATOR II, one of the most important data bases on Canadian biodiversity. Apart from publishing the present journal, it carries out various biosystematic studies and biodiversity inventories and analyses, advises on biodiversity nationally and internationally, and will at some point play a crucial role in that field. It is worth noting that several plant and vertebrate taxonomists were laid off or forced to retire following the recent budget cuts and reorganization of the museum services, a situation that is quite alarming.

Formed in 1988, the National Round Table on the Environment and the Economy (NRTEE) is an independent forum composed of individuals from government, business, science, environmental groups, academia, labour unions, and native peoples. It closely monitors the impact of industries and tourism on species and ecosystems. Following the Earth Summit, it organized meetings for specialists and published some reports on the matter.

One of the founding groups of COSEWIC, The Canadian Nature Federation (CNF), recently implemented a new programme. Judging that threatened plants and invertebrates were being neglected in favour of vertebrates, the programme aims to protect these specific groups.

Another group, the Nature Conservancy of Canada monitors the status of Canadian species and ecosystems through its Centres of Data on the Natural Heritage. Within the framework of this programme, critical habitats are listed and described, and data are collected on the species found therein. Such centres have already been established in Quebec and British Columbia, and will soon be created in Manitoba.

For many years now, World Wildlife Fund Canada (WWF-Canada) has been concerned with the status of threatened species in Canada and has supported various conservation projects through its Endangered Species Recovery Fund. Unquestionably, its Endangered Spaces programme is one of its most dynamic initiatives. This ambitious national campaign aims to protect a minimum of 12% of Canada through the designation of protected spaces.

Finally, one should not forget the increasing role of zoos in the conservation of biodiversity (Prescott and Hutchins, 1991). Visited by more than 100 million people every year, North American zoos are the perfect place to educate the public. More than 90% have an educational service, and for a decade, they have primarily focused on the conservation of nature. Through innovative research, zoos have developed breeding and rearing programmes for rare animals. At the same time, they have contributed to the development of small population biology. The study of inbreeding and its effects on wild animals is a good example of the latest research being carried out in zoos (Prescott, 1993).

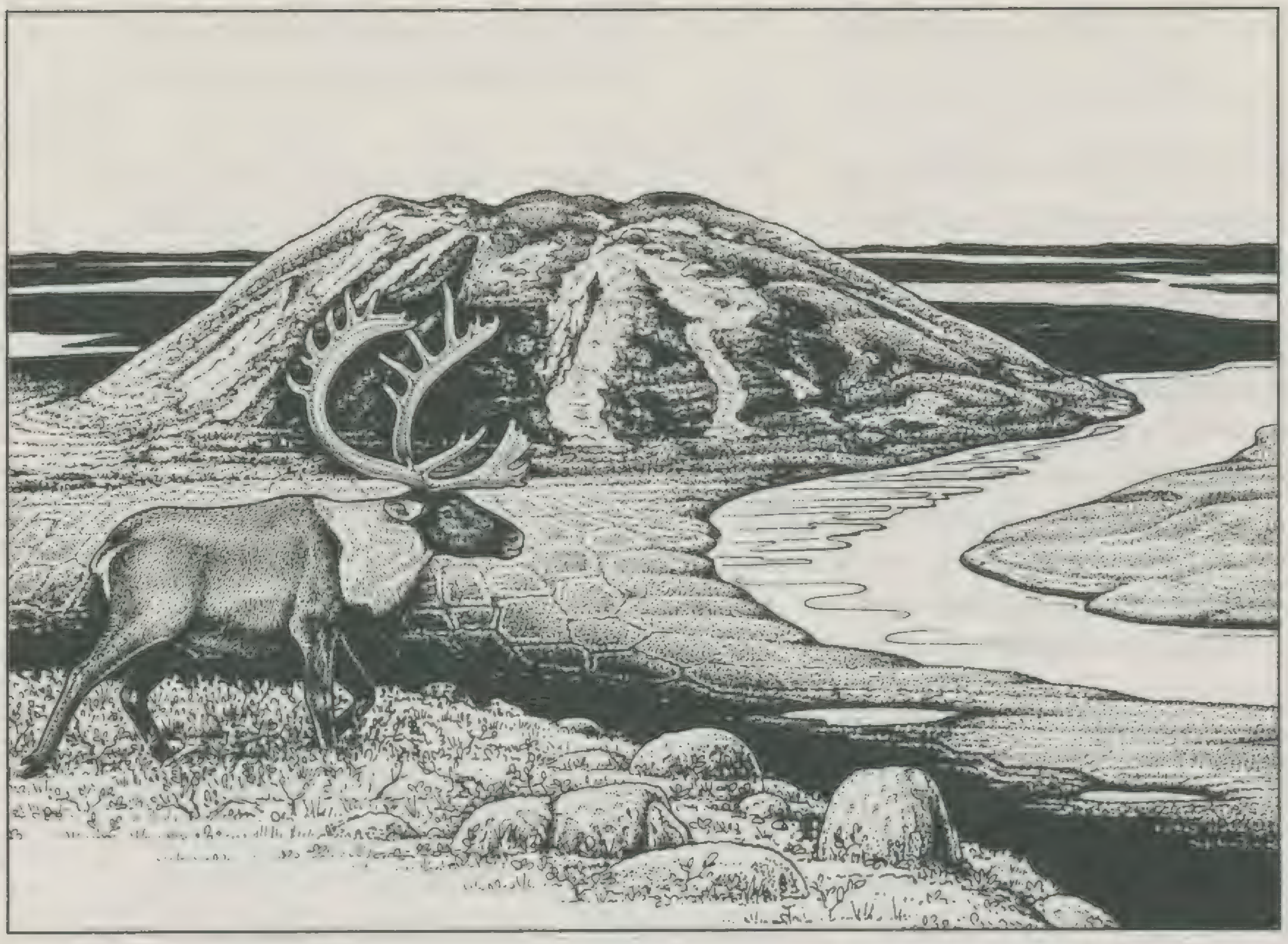
In Canada, cooperation between the Canadian Wildlife Service and some zoological gardens has led to the reintroduction of the wood buffalo and the swift fox in their natural habitats. The Metro Toronto Zoo recently implemented an ambitious rearing programme of the black-footed ferret in order to reintroduce it to the Canadian prairies, and the Calgary Zoo is actively participating in the whooping crane rearing programme.

WHAT ARE THE LIMITS?

Unfortunately, those commendable initiatives are limited in scope and have a negligible impact on our daily way of managing living resources.

For too long federal and provincial biodiversity initiatives have ignored non-governmental interests, which have the potential to make a significant contribution. Governmental agencies, stuck between their desire for autonomy and their financial constraints, should learn to ask specialized agencies for help. Not only do zoological and botanical gardens, aquariums, natural science museums, conservation groups, and several scientific associations and societies possess a level of knowledge on biodiversity that is the envy of many, they also reach a wide audience. Whether it has been to study particular problems or carry out public education programmes, why has the cooperation of these organizations never been sought?

George Connell (1992), chairman of the NRTEE, has even acknowledged "that the Round Table has not as yet defined a consensual position on the main issue" of biodiversity. Also, it does not yet know how its



The Convention on Biological Diversity recognizes the need to protect biological diversity for the benefit of present and future generations. The hill in this tundra scene has been caused by frost heaves and is called a pingo.

"mandate to bring together environmental and economic issues in the search for sustainable development should be pursued."

Monte Hummel, chairman of WWF-Canada, recognizes the limits of his actions by stressing that environmentalists as well as resource users (loggers, hunters, fishermen) have to accept the fact that both approaches—protection and sustainable use—are necessary to maintain biodiversity (Hummel, 1992).

In my opinion, academics should play a major role in this debate. Universities overflow with specialists involved in the study of numerous facets of living organisms, reflecting on the relationship between man and nature. However, biosystematics, the science that allows us to describe and classify living organisms, is rarely included in academic programmes (Idema, 1993). Universities must, therefore, take the necessary measures to correct that situation, and commit themselves to contribute more to the inventory and monitoring of the living resources of our planet. They must also aid in the development of socioeconomic models integrating economics and environment.

A NATIONAL FORUM ON BIODIVERSITY

The Canadian government carried out extensive public consultations in preparation for the Rio Summit, and the Canadian delegation included an unequalled number of non-governmental representatives. If we want to pursue our role as a leader in biodiversity conservation, we must carry on and broaden the dialogue between civil servants and public sector representatives, and encourage the involvement of new partners. To that end, some people have proposed a National Forum on Biodiversity. Such a forum would allow all Canadians to better understand the importance of biodiversity. In addition, it would encourage the development and implementation of the national strategy that we all wish for. In the meantime the consultation undertaken for the development of a National Strategy for the Conservation of Biodiversity will contribute to the widening of the circle of involvement.

TOWARDS A NATIONAL STRATEGY FOR THE CONSERVATION OF BIODIVERSITY

Close examination of the 42 articles of the Convention on Biological Diversity should help us in the development of a National Strategy for the Conservation of Biodiversity. Some elements that should be taken into account are listed here.

We will have to

- promote at the global level the inclusion of biodiversity conservation and sustainable use objectives in sectorial plans, agricultural and forestry programmes and politics, and fisheries and environment.
- identify the habitats and areas harbouring the highest level of biodiversity (e.g., the Carolinian forest of southwestern Ontario, prairies and parklands, wetlands, coastal and marine habitats, northern regions, etc.).
- broaden the mandate of COSEWIC and RENEW in order to cover as many taxa as possible, including insects, other invertebrates, and cryptogams (mosses, lichens, algae).
- financially support biodiversity data banks and coordinate sampling and monitoring efforts.
- complete the national parks network and establish new nature reserves.
- incorporate and promote ecosystem management in all federal and provincial government activities.
- offer incentives for the conservation of wetlands and the rehabilitation of marginal farmlands.
- discourage single species management programmes.
- include courses on ecological management in education programmes and increase the financing of environmental education agencies.
- develop an evaluation and certification programme of genetically-engineered organisms.
- develop criteria, protocols, and regulations for every new species introduced in Canada.
- implement measures for the control of introduced species that are causing problems at the local level.
- develop strategies for the use and enhancement of living resources in cooperation with native communities.
- promote and support the training of biosystematists at the university level.
- review existing programmes, politics, and regulations and modify them if necessary in order to insure the conservation of biological diversity.

And the list goes on and on.

In six points Jeffrey McNeely (1992), an IUCN specialist in the field, summarizes the challenge posed by the conservation of biodiversity:

1) Can we continue our investigative efforts in view of improving our knowledge of how ecosystems function?

2) Can we supply policy makers and the general public with correct and appropriate information?

3) Can we put measures into place that foster the conservation of biodiversity?

4) Can we promote a multidisciplinary and intersectorial approach?

5) Can we develop international cooperation in this field?

6) Can we give back to native communities, whose revenues are drawn from the use of renewable resources, the possibility to manage their own resources?

The Convention on Biological Diversity is the backbone of our efforts aimed at sustainable development. All that we have to do now is to flesh it out so that we may move in the right direction!

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In the fall of 1993, the Canadian Museum of Nature carried out a telephone survey of some *Global biodiversity* subscribers. Thank you to all those who took the time to talk about the publication and for your thoughtful comments and suggestions.

Invitation *to* readers

One finding of the telephone survey was that we learned some readers are not aware that we regularly invite submissions from readers (see inside front cover). And so, *we now not only invite you to submit material, we encourage you to do so.* Many of you are working directly in the field of biodiversity research, conservation, and wise use, and your philosophies and practical findings are welcomed.

Submissions usually fall into three categories:

PAPERS Research results, conservation strategies, behind-the-scenes discussions, and in-depth looks at biodiversity initiatives are invited for this section. All papers are sent out for scientific vetting and basic editing before publication.

VIEWS One of the goals of *Global biodiversity* is to establish an open international forum where ideas can be freely expressed. Only by open discussion can we ever hope to save the biodiversity of the Earth. Recognizing that many philosophies and approaches to biodiversity conservation are controversial, point-of-view essays are asked for. These articles can offer new ways of thinking about certain subjects, provide constructive criticism of current methods and practices, or advocate particular positions. We expect that some readers may disagree with some of the views in this section. If so, please drop us a line by mail or fax (613) 990-8818 and explain why. Your comments could provide enough fodder for a brand new section of the publication, tentatively titled FEEDBACK, in which we would publish differing views or other comments.

NEWS There is a great deal happening in the biodiversity field—and it is happening very quickly. Any news tips or notices of meetings or reviews of new literature in your field are welcomed. Please let us (and others) know what is happening in your speciality or area of concern.

We look forward to receiving your comments, suggestions, news tips, and material SOON.

When and How to Submit Material:

Please be aware that we assemble issues four months in advance of publication. Publication dates usually coincide with the annual equinoxes and solstices. And so, for instance, as you read this, we are already at work on Volume 4, Number 1, to be published in June. Therefore, feedback on any articles in this issue or any current news notes should be submitted *immediately*, and we will try to squeeze them as soon as we have an opening. Please send by fax (613)990-8818. All other material should be submitted as far in advance as possible.

If possible, material should be submitted on disc in WordPerfect to the attention of Don McAllister at the address on the inside front cover. Modem transmissions can also be arranged by contacting Noel Alfonso, Technical Editor, at (613) 990–2207.

Does NAFTA enhance or threaten biodiversity?

NAFTA has two ways of affecting the environment. One is achieved directly by the contents of its Articles on the environment—what they say and what they omit. The other effect is indirect. NAFTA was drafted with the primary intent of promoting international trade and industry profit, not with benefiting society as a whole or the environment. Goods will be moved long distances if it makes good business sense, even though it may not make environmental or social sense. To what extent does NAFTA promote old-style development, reflecting the closed process of its creation, as opposed to the new ecologically sustainable development envisioned in the just ratified Earth Summit? Readers may also wish to consult the Canadian government environmental review of NAFTA, which concludes (p. 71), "In brief, the NAFTA establishes a new bench mark for environmentally sensitive international trade and economic relations. The environmental provisions of NAFTA would go well beyond those of any previous trade agreement." Or readers may wish to read the Scientific American *debate: Does free trade harm the environment? (Bhagwati : pro-trade, Daly: anti-trade) 1993.*

[D.E.M.]

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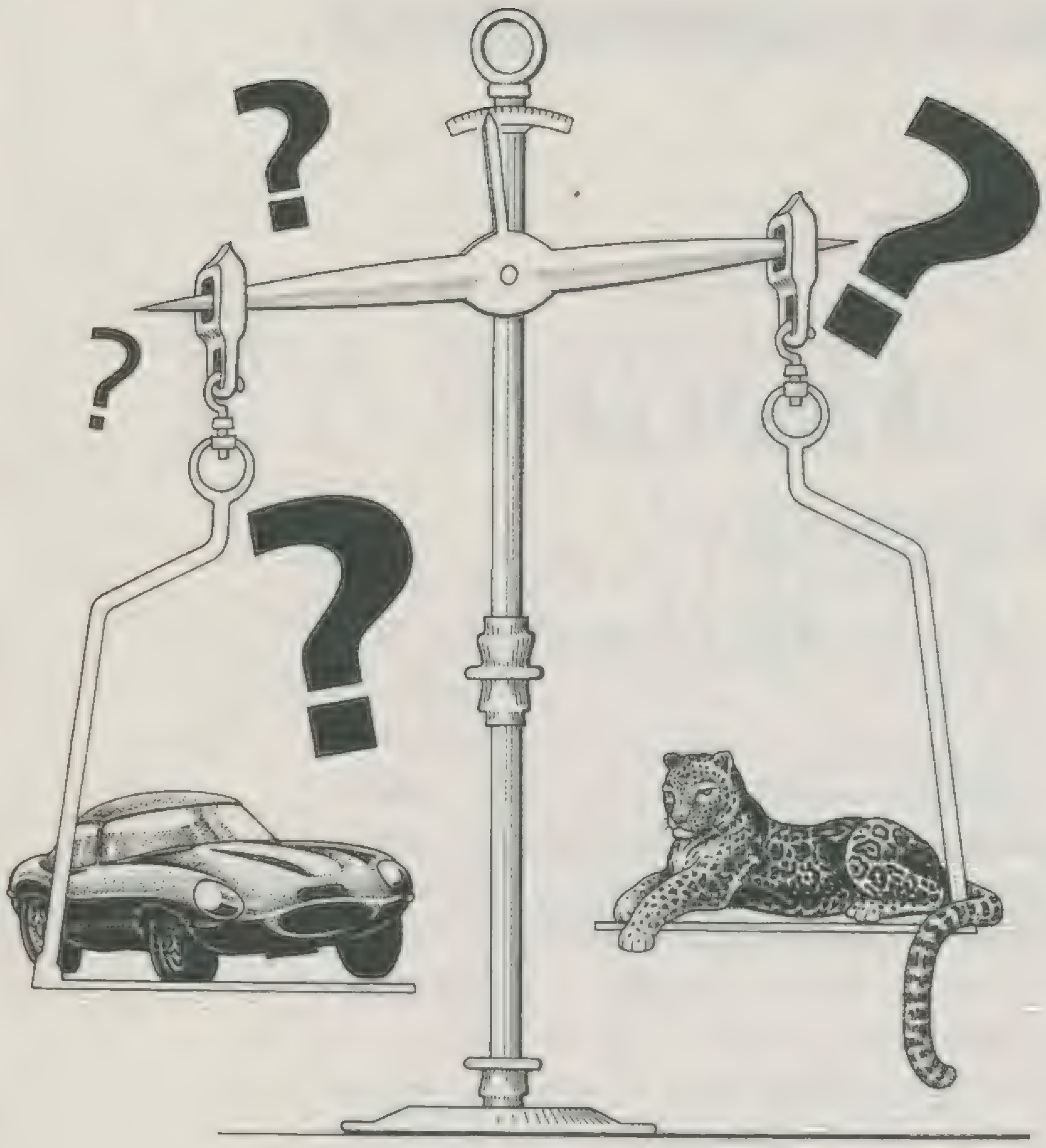
The North American Free Trade Agreement (NAFTA) may seem to have little to do with the problems involved in maintaining biodiversity at the genetic, species, or ecosystem levels. However, NAFTA and other ostensibly economic agreements aimed at "liberalizing" international trade, such as the Canada/United States Free Trade Agreement (FTA), and the Uruguay Round of the General Agreement on Tariffs and Trade (GATT), have major implications for biodiversity. These economic agreements affect the way in which individual countries can look after their natural resources such as timber, river systems, and minerals, as well as perpetuate genetic variations, use chemicals in agriculture, and guard against the spread of exotic organisms. Anyone concerned with the maintenance of biodiversity should be aware of these implications, and be prepared to warn the policy-makers who have entered into these agreements of the potential ecological costs.

We need to view NAFTA in the context of the world-wide drive toward economic "globalization," the integration of all areas of the world into a single market economy. What this means for biodiversity is that it will increase the ease with which global corporations can exploit individual ecosystems and bioregions and then move on, leaving biologically impoverished areas in their wake. A key element in this drive toward globalization has been the political effort by the United States, generally supported by other industrialized market-driven states, to establish a framework of international rules that will facilitate the free movement of international business. At the same time, the treaties handicap any state that tries to pull out of the world market system. Rich and poor countries alike are therefore locked into a system whose main beneficiaries are multi-national private corporations. Free to roam wherever they wish on the planet in search of the resources they need to conduct their business, these corporations know that the treaties limit the ability

The Canadian Museum of Nature is pleased to provide an open forum for diverse viewpoints even though they may not represent the views of the Museum itself. Comments on these viewpoints are encouraged. Please mail or fax them to Don E. McAllister (address on inside front cover).



of *any* jurisdiction to provide effective protection against the destruction of any or all ecosystems within its boundaries (Shrybman 1990; Cartwright 1994).

NAFTA, like all other arrangements for "freeing up trade," aims at **economic growth** or the expansion of consumption of goods and services. It is sometimes argued that by increasing the prosperity of individuals, economic growth leads to a decrease in the rate of population growth, and thus restrains the growth in pressure on our planet's resources. However, the increase in *per capita* consumption that characterizes economic growth can be at least as devastating for biodiversity at all levels as is sheer growth in population, and thus offsets any reduction in population growth rates.

Just how does economic growth affect biodiversity? First, there are the direct effects. Growth can involve the increased exploitation of natural resources (e.g. logging of forests, land converted from natural ecosystems to growing crops or cattle feed), and thus, the reduction of the level of ecosystem biodiversity as well as the elimination of particular species or gene pools. Second, there are various indirect effects: (a) the disruption of ecosystems in an area being exploited (e.g. a road into a mine, the hydro line cut from a new power dam) and (b) the by-products of the exploitation (e.g. mine tailings in a river course, soil erosion, herbicides affecting underground water or wildlife, acid rain, or global warming from emissions of "greenhouse gases").

Against these negative effects of growth on biodiversity, proponents of freer trade can make several arguments:

1) To the extent that trade permits more efficient use of resources, we can achieve the same level of outputs of goods and services with less use of these resources. This, of course, assumes that we will be content to stop at a specific level of output, rather than using the savings to permit more outputs in other areas.

2) More prosperity means we can "afford" to invest more dollars in the abatement of pollution or in the protection of natural areas for biodiversity. However, experience suggests that environmental concerns are generally viewed as luxuries to be dealt with only *after* material wants are satisfied.

3) Possibly, even if people do not demand that more natural areas be protected, they will devote a larger proportion of their increased wealth to services as prosperity increases. On the whole, services tend to be less damaging to natural environments. One specific indication of this trend is the growing interest in eco-tourism, which tends to seek environmentally undamaged areas. While the accompanying infrastructure of roads, hotels, and other tourist facilities can do substantial damage to ecosystems, these would be at least as badly damaged in many cases by any alternate use. On the plus side, tourism can provide an incentive and the financial means for poorer countries to protect portions of their natural environment.

4) In some areas, the technological innovations that accompany rising prosperity can be less damaging and less exploitive of the natural environment than older technologies. For example, the use of more fuel-efficient cars reduces pressure for oil exploration, although the higher compression ratios of modern engines produce more nitrous oxides than did older vehicles.

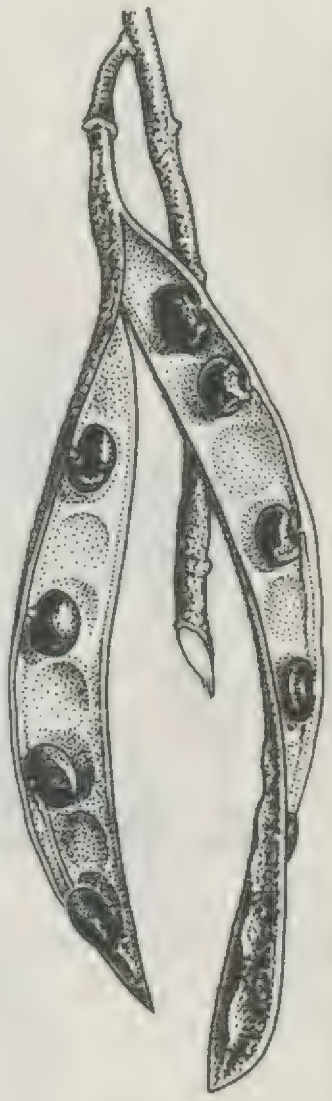
However, how well do free trade arrangements promote these goals? Here we get into the policy question of **which** areas receive incentives, and which are discouraged by the specific details of the agreement. For example, in the FTA between Canada and the United States, subsidies from governments to oil companies to explore frontier areas were specifically allowed, provided they were applied equally to Canadian and American companies. Unfortunately, there was no such protection for a government that chose to subsidize energy efficiency in industries, rather than trying to find more fuel. The result is that Canada can provide tax breaks to oil companies exploring offshore or in the Arctic, but if we try to give the same value in tax breaks to companies seeking to reduce their consumption of oil, we are open to charges of "unfair subsidization" and the US can impose retaliatory tariffs on our exports. Economists will argue that the proper way to deal with this problem is not to offer any subsidies in either area. But is it politically realistic to expect to end all subsidies to oil companies, or desirable not to subsidize improvements in fuel efficiency?

In essence, NAFTA provides for the reduction of tariff and non-tariff barriers to the free movement of goods and services between Canada, the United States, and Mexico. To resolve disputes, it provides for the establishment of arbitration panels of experts in trade matters, and in cases where scientific matters are involved, a board of qualified scientists to advise the arbitration panel. Its scope is broad; it covers not only physical commodities, but also trade in services and "intellectual property," or in other words, trade in saleable ideas.

Among the key sections of NAFTA that threaten biodiversity are those involving exploitation of natural resources, measures to prevent the spread of plant and animal diseases, and requirements for exports. These parts of NAFTA are, for the most part, replicas of those in the FTA. Article 315 provides that there shall be no cutback in the proportion of any good exported from one party to the others; in other words, if we sell a third of our lumber production, oil, or irrigation water to the US now, we cannot cut that proportion back in the event of a shortage. In the event that this production rate is causing environmental damage, we must cut our domestic use by the same proportion. Article 605 repeats the same requirement with respect to energy, thus doubly covering electricity, oil, and natural gas. Article 608 allows us to provide any "future incentives" (i.e. tax breaks and other subsidies) for oil and gas exploration and development, whereas any form of subsidy for conservation of resources, including energy, could run afoul of the basic "national treatment" provision of Article 301. Article 301 says we must provide "no less favourable" treatment for American and Mexican goods than we do for our own. In other words, we cannot provide any special incentive for a Canadian-based company to undertake conservation measures unless we provide the same incentive to any American or Mexican company selling goods in the same areas as the Canadian company.

Certain provisions in NAFTA appear to allow us to protect existing environmental standards, but do they? With respect to the use of agricultural chemicals such as pesticides and growth substances, for example, Article 712 allows each country to take "any sanitary or phytosanitary measure necessary for the protection of human, animal or plant life or health within its territory, including a standard more stringent than an international standard, guideline, or recommendation," provided the standard is established on a "scientific basis." However, in establishing its standards, Article 715 requires each country to use a "risk assessment" approach, balancing environmental harm against economic gains from the use of a substance or an approach, rather than simply asking, "Is this substance harmful?" To underline the importance of this trade-off, Article 715 also requires a country to "take into account" both economic considerations and "the objective of minimizing negative trade effects." Two problems arise here: first, in the event of a dispute between countries, the arbitration panel does not have to contain any members capable of evaluating scientific evidence; and second, even within the scientific community, there are frequently deep disagreements over the interpretation of scientific data. What some Canadian scientists may regard as sufficient evidence that a curb should be placed on an imported substance may not be so regarded by the international panel that rules on the resulting trade dispute.

Any environmental policy that is stricter than the other members' policies is open to challenge and trade penalties under two general articles. Annex 2004, on "Nullification and Impairment," allows each government to challenge any action by either of the other countries that it thinks denies its citizens a benefit they could expect under NAFTA. For example, if the Quebec government were to prevent an American company from setting up a hazardous waste disposal plant in Quebec to handle American toxic wastes, the American government could launch a dispute. Likewise, a dispute could be launched if Ontario were to require Ontario Hydro to use low-sulphur Western Canadian coal instead of high-

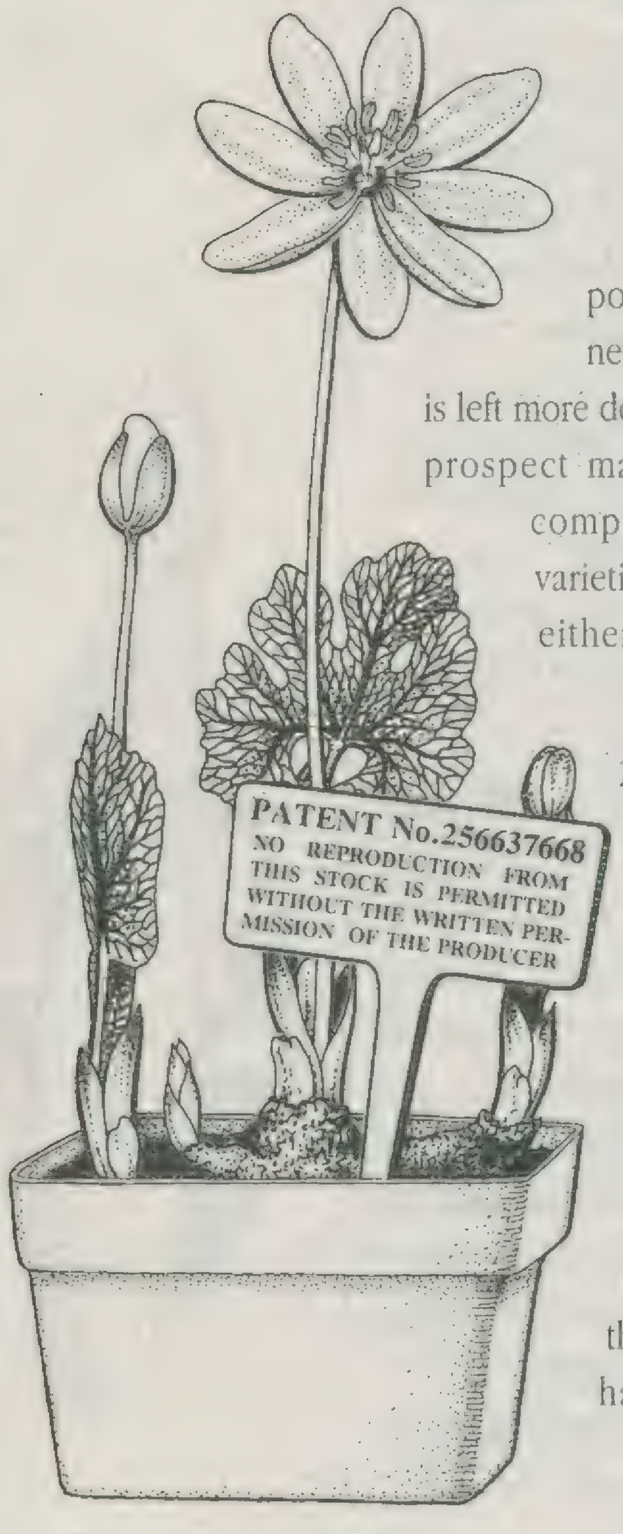


sulphur US coal. If Canada were not to either withdraw the offending policy or pay compensation once the settlement mechanisms of Chapter 20 had been used, then under Article 2019 the US would be entitled to retaliate with "equivalent" penalties (e.g. it could impose a penalty tax on Canada's paper exports).

One threat to biodiversity, which did not arise in the FTA and is included in NAFTA, is the contentious area of Plant Breeders' Rights, the right to patent and thus control the availability of a new variety of domesticated plant. Here NAFTA simply confirms, and thus makes difficult to reverse, what the United States and Canada have already done: namely, to allow plant breeders to protect through patents any new varieties they have created. There are two main dangers here:

1) In order to show that patented plant varieties are, in fact, different from established varieties, each country will have to establish a list of existing varieties and ban any unlisted varieties from commercial use (as the European Community has already done) (Vellv 1993). This necessarily involves a considerable investment of time and money to ensure that each variety breeds true, an undertaking that only is financially feasible for widely sold varieties. The result will be the further elimination of the genetic variation in domestic plant species. In turn, future possibilities for breeding in resistance to new pathogens are reduced and agriculture is left more dependent upon chemical pesticides. This prospect may be good for the major chemical companies that now produce most seed varieties, but it is not good for the health of either people or ecosystems (Fowler and Mooney, 1990).

2) The attempts in the Uruguay Round of GATT to bring "intellectual property," including protection for patented plant varieties, under the system of international trade sanctions is a second danger. Effectively, Third World countries, which provide much of the germ plasm for breeding new varieties of plants, will be excluded from the financial benefits of patenting these plants simply because they do not have the research capacity, and more importantly, the marketing capabilities of the major seed corporations. Thus, they will be forced to pay Western corporations for the right to buy back patented varieties of seeds, which were only made possible in the first place by the taking of their germ plasm. Some Third World countries have already passed laws to deny Western corporations access to their seeds. However, enforcement of these laws is problematic, and the issue will increasingly embitter relations between the Third World and the West (Crump, 1987). Moreover, particularly for export crops, Third World countries may be forced into relying on the patented varieties of seeds, while their much more genetically diverse but less productive varieties will disappear.


PATENT No.256637668
NO REPRODUCTION FROM THIS STOCK IS PERMITTED WITHOUT THE WRITTEN PERMISSION OF THE PRODUCER

Despite its references to fair treatment for and access to biotechnology by developing countries, the recently adopted Biodiversity Convention provides no protection against this stranglehold over seed supplies by multinational corporations. Article 16 (2) explicitly requires any transfer involving patent rights to be "consistent with the adequate and effective protection of intellectual property rights." On a broader scale, all the articles dealing with the distribution of benefits from genetic research say that the benefits are to be distributed on "mutually agreed terms." Thus, presumably, a corporation can charge whatever it can make the developing country's market pay for its seeds.

In summary, the NAFTA rules are skewed against the maintenance of biodiversity in key areas. Any policy that involves offering financial incentives for businesses in one country to produce commodities in environmentally sound ways, whether these are for export or for sale in its domestic market against other NAFTA imports, can be challenged. At the same time, it encourages subsidies to the oil and gas industry for expanding the availability of fossil fuels. Its silence on whether a country can lawfully look at the environmental effects of how a product is produced hinders progress in promoting environmentally friendly methods of production. For instance, if the Canadian government wanted to insist that imported goods as well as domestic ones be produced in an environmentally benign way, it could not do so. Finally, NAFTA's support for the "intellectual property" of patented seed varieties threatens a dramatic reduction in the availability of genetically diverse varieties of seeds.

Now that NAFTA has come into effect, the best we can do is to modify its most harmful effects. While the power of individual governments to restrain the threats to biodiversity is severely curbed by NAFTA, the Canadian and Mexican environmental groups will gain from the support of their relatively more powerful counterparts in the United States. While it seems likely that NAFTA and other "free trade" arrangements will serve to thwart national environmental controls on businesses, there are some areas where the dominant partner, the United States, will suffer as a result of the lower standards of Canada and Mexico. Here, it is possible that a combination of environmentalists' pressure in all three countries combined with American nationalism will force a "levelling up" of standards. There is already a model for a possible lever here. The Single European Act of 1986, which was made a part of the European Community Treaty, provides, among other requirements, that actions to improve the functioning of the internal European market will incorporate a high level of environmental protection (Henderson 1993). While this act does not guarantee that environmental considerations will override more conventional economic cost factors, it does impose a requirement that is presently ignored by both NAFTA and the GATT.

On balance, I conclude that NAFTA will have serious negative effects on the preservation of biodiversity. The best we can hope for is to mitigate some of the more harmful effects through a concerted demand in all three countries that these key areas of NAFTA be amended to incorporate environmental protection as a goal.

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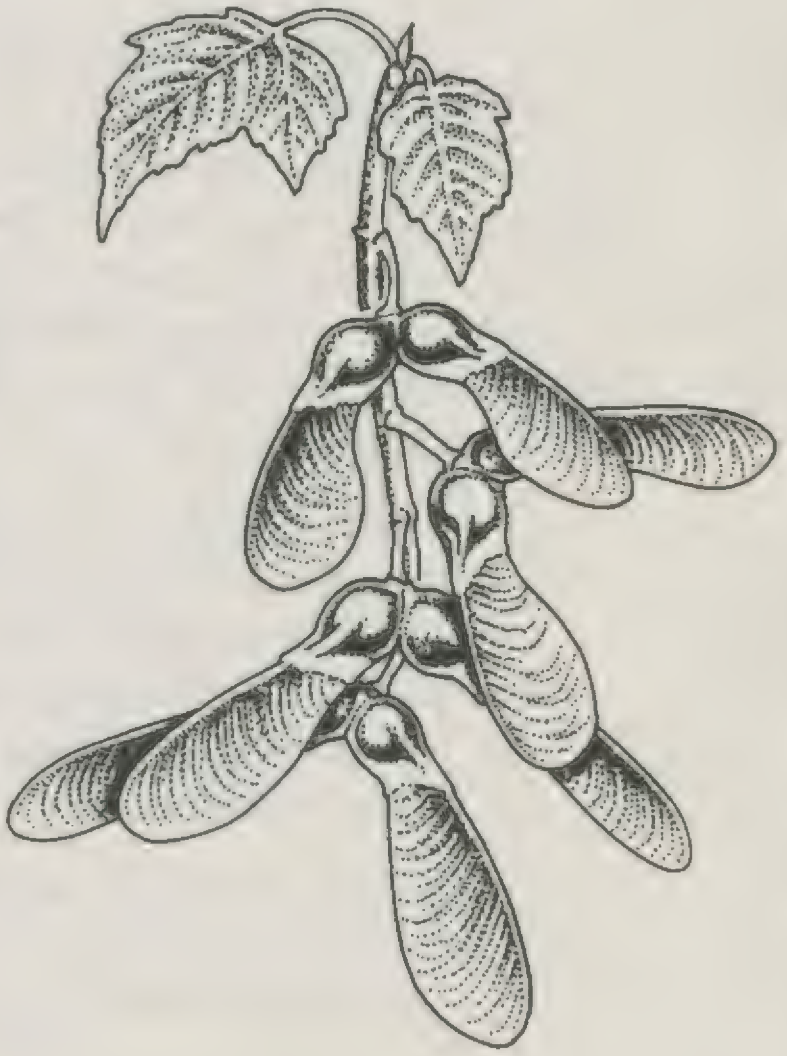

THE ESSENTIAL PRECONDITION FOR A SUSTAINABLE ECONOMY:
A negative population growth

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THE FACTS

President Clinton recently created the President's Council on Sustainable Development whose task will be to develop ways to keep the economy growing without depleting natural resources.

That is, quite obviously, an impossibility. Any industrial production that uses non-renewable resources mined from the earth (iron, copper, oil, coal, natural gas, etc.) cannot avoid depleting natural resources. The larger the scale of production, the faster the rate of depletion. That brute fact can be ignored (and no doubt will be by the President's Council), but it cannot be successfully refuted.

President Clinton has shown that he is willing to grapple with difficult issues (e.g. the deficit, health care). If he decides to grapple with the thorniest issue of them all—economic growth—he should appoint a President's Council on Sustainable Economic Activity, and charge it with determining what level of economic activity is sustainable over the very long term, and how we could achieve that level.

Such a Council would be hard pressed not to recognize that, both in the United States and the world, the present scale of economic activity is far too large to be sustainable. A long list of environmental ills support that assertion: global warming, the thinning of the ozone layer, deforestation, forest depletion, etc., etc.

As Prof. Herman Daly has pointed out, the economy is a subset of the biosphere, and the scale of economic activity relative to the biosphere has grown too large to be sustainable. In order to be sustainable, the present level of throughput of energy and materials certainly cannot be allowed to grow. Period. On the contrary it must be substantially, or even drastically, reduced.

How could that be accomplished, and what would be the impact on human welfare of measures to achieve a sustainable level of economic activity?

Our impact on our environment, in terms of pollution and resource depletion, is the product of numbers of people multiplied by per capita consumption of energy and materials. It follows, therefore, that there are three ways—and only three ways—by which that impact can be reduced:

- firstly, reduce the number of people by a negative rate of population growth, or
- secondly, reduce excessive consumption (in the United States and other developed countries) by simplifying lifestyles, or
- thirdly, reduce resource depletion and pollution per unit of production, by learning to use energy and materials more efficiently.

Population size is by far the most important of the above three variables. Nevertheless, our present scale of economic activity is so large relative to the biosphere that all three measures will be necessary in order to reduce it to a level that will be sustainable indefinitely.

But, it will be objected, most of the world's people now live in abject poverty. If reducing the scale of the human economy means an end to economic growth, how then can poverty be eliminated?

Before addressing that question, I should note that we at NPG (which stands for Negative Population Growth) maintain that universal poverty will be the inevitable result of aggregate (total) economic growth in an overpopulated world. Why? Because in a matter of a few decades at most, resource and environmental constraints will act to first halt and then diminish industrial production, so that each person, even if population were stabilized at the present level, will have a smaller slice of a smaller pie.

If population continues to grow, then the smaller pie of industrial production will have to be divided into an even greater number of slices. Each slice (each individual's share of the whole) must then be correspondingly smaller. The result will be almost universal poverty.

We are simply living in a dream world if we believe (or pretend to believe) that in a world of 12-14 billion people, economic growth can bring living standards up to an adequate level, and then sustain them there. The resulting scale of human activity would be far too large to be sustainable.

Since the global economic pie must be smaller in order to be sustainable, the only way to have a larger slice (a better standard of living) for each individual is to have fewer individuals, that is, a smaller population, both for this country and for the world.

In order to achieve both a sustainable level of global economic activity and an adequate standard of living for everyone, we must somehow bring ourselves to recognize that the population size is not only a key variable, but by far the most important of the three variables that produce our scale of economic activity.

POLICY IMPLICATIONS

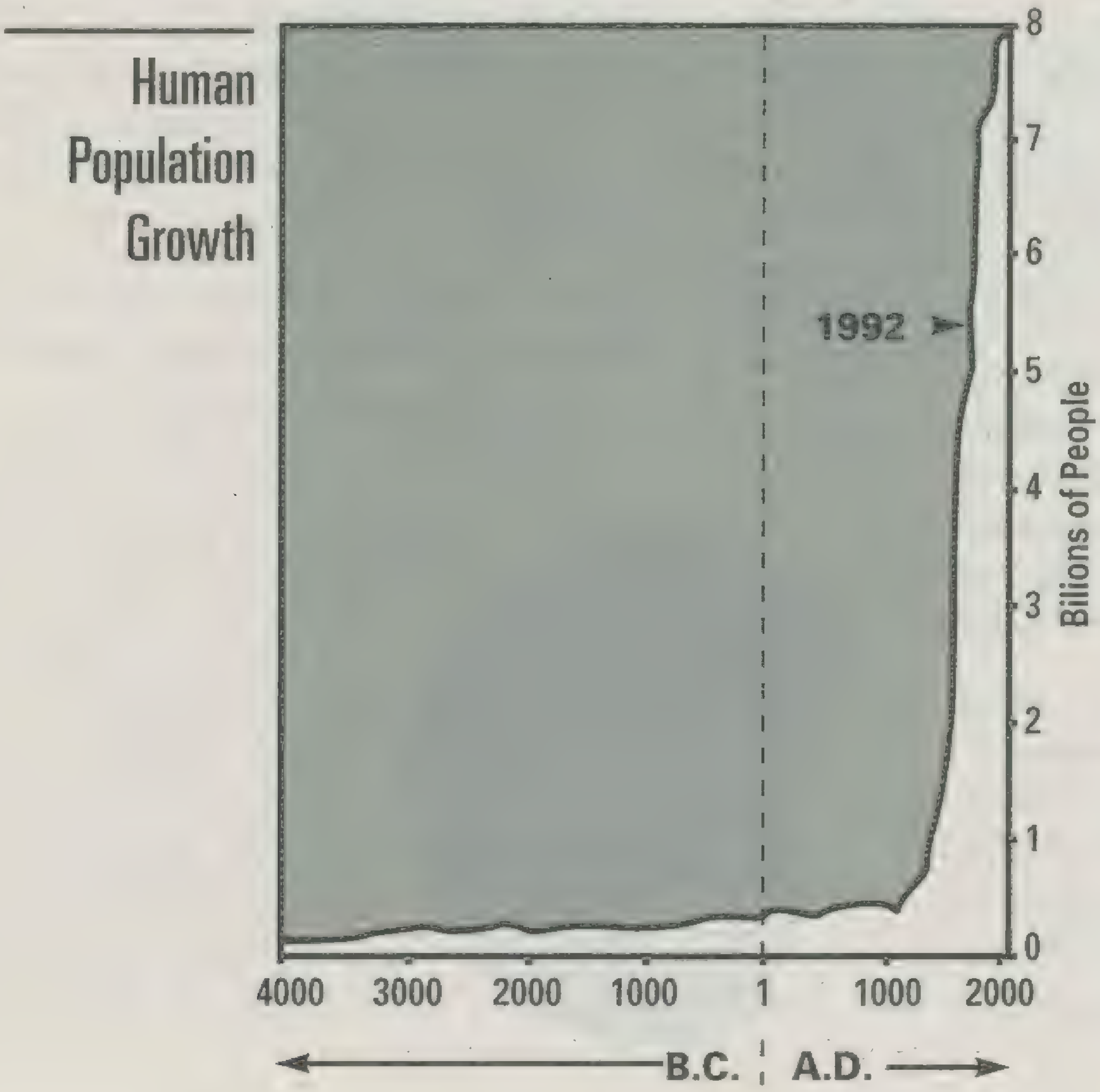
What are the policy implications of the above analysis? The essential one has to do with the optimum rate of population growth.

If we determine that the present scale of the human economy must be reduced in order to be sustainable, then it follows that the optimum rate of population growth can only be negative.

It is not necessary to determine at this time the exact scale of economic activity that would be sustainable before we put into effect measures designed to achieve a negative rate of population growth. It is sufficient to know that a sustainable scale is far smaller than the present one. At best, reducing population size to a sustainable level will require many decades, if not centuries. There will, therefore, be ample time to conduct research to determine the approximate scale of economic activity that would be sustainable indefinitely.

These are the fundamental and vitally important issues that a President's Council on a Sustainable Level of Economic Activity ought to be grappling with.

With the present rate of growth of human population and the need to provide for agricultural, forest, and fisheries products, the amount of space for all other species is already shrinking. Already we are using 60% of vegetated land for farms, managed foressts and recreation.



A GLACIAL RELICT WITH A PREGLACIAL FISH ASSEMBLAGE:
Tutizzi Lake

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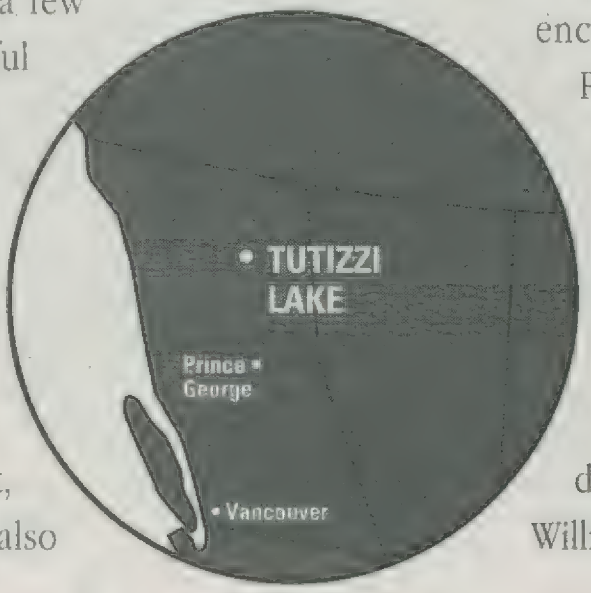
Cochrane, AB T0L 0M0, Canada

Ms. Pharis is Director of the Alberta Wilderness Association and a member of the Baker Family of Fort St. John, B.C., owners of a small plot of land on Tutizzi Lake, B.C. This article is included as a vignette on the tensions developing between competing uses and values as hundreds of thousands of hectares of wilderness around the world vanish each day. Recent World Wildlife Fund reports suggest that 2,500 hectares of wilderness are lost each day in Canada.
[D.E.M.]

SETTING THE SCENE

Of all the massive rivers feeding into the Mackenzie River system, the Peace is different. While the rest arise along the Rocky Mountain divide, the Peace arises from ranges in the interior of north central British Columbia (B.C.), breaking through the Rockies to flow east and eventually north, into the Arctic Ocean. Before the ice ages rearranged the landscape of the area, the headwaters of the Peace likely flowed west into the Pacific Ocean. A good indication of this is the mix of Pacific and Arctic drainage fish species found in a few relic lakes like the unique and beautiful Tutizzi, at the top of the Mesilinka River.

Tucked into a valley of the Omineca Range, Tutizzi Lake contains near-pristine native populations of rainbow trout, lake charr, Dolly Varden, Arctic grayling, mountain whitefish, and burbot. It is speculated that bull trout, and pygmy and lake whitefish could also exist in Tutizzi. Since there has never been a formal biological survey of the lake, there is no knowledge of the assemblage of non-game species. Knowledge of the game fish comes from fly-in fishers. During the 1970s and early 1980s, before the threat of clear-cut logging destabilized its future, an exclusive fly-in fishing lodge operated on Tutizzi, catering to sophisticated fishers who sought wilderness experiences and rare fish. Because of Tutizzi's 1000-metre elevation and the low productivity of its cold waters, the lodge was operated on a catch-and-release basis.



Fisheries biologists C.C. Lindsey and J.D. McPhail, who have studied the fishes of the Yukon and Mackenzie basins, claim that the headwaters of the Peace River were the site of a major faunal exchange during deglaciation. This exchange enriched the fish fauna of both the Arctic and Pacific drainages. In the words of Alberta fisheries' biologist, David Mayhood, Tutizzi's assemblage of game fish is "a relatively rare association" that deserves both protection and scientific investigation. In its isolated situation, Tutizzi is likely to be an island of intact genetic fish stocks.

In 1990 David Mayhood requested that the federal Department of Fisheries and Oceans fish habitat division conduct studies on Tutizzi. He wrote:
"The native fish assemblage in Tutizzi Lake can only be found in a small area of North America encompassing the Finlay, Parsnip and Peace drainages in the upper Peace River basin of northeastern British Columbia. Even within that range, such an assemblage is likely to be restricted to certain types of lakes. The association in some of these other lakes already may have been destroyed, e.g. from inundation by Williston Lake, or by trout stocking. The

native stocks of Tutizzi Lake are valuable for zoogeographic, conservation and management purposes."

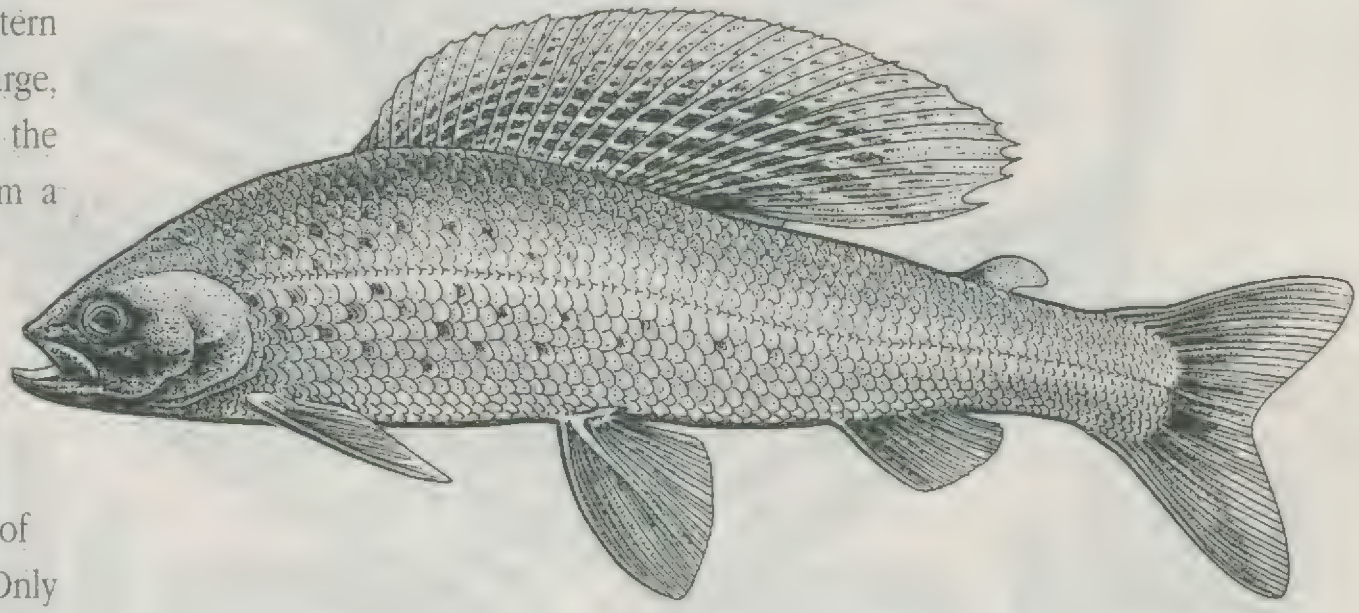
Tutizzi Lake and its downstream waters constitute one of only three areas in North America where rainbow trout are native, east of the continental divide. Native lake charr are a virtual anomaly in a rather small northwestern lake like Tutizzi. They are much more common in large, deep lakes of eastern Canada. Occurring in Tutizzi, the lake charr must be a remnant population from a preglacial lake. Biologists consider associations of lake charr and bull charr or Dolly Varden to be uncommon, as the latter are usually eliminated by the more aggressive lake charr. Apparently bull charr and Dolly Varden are a curiosity in the area of the upper Peace, as separate populations of both can be found there, along with their hybrids. Only a proper analysis can show if lake and pygmy whitefish occur in Tutizzi, in addition to mountain whitefish.

The value and significance of Tutizzi's association of fish is explained by David Mayhood:

> "Freshwater fishes live in relatively isolated, island-like habitats. This association favours the development of distinctive stocks with unique characteristics not completely shared by other populations in the species, or even by other stocks within the same population. This diversity is the insurance that the species takes out against the possibility of extinction through changes in environments, and the capital it requires to continue to evolve.
>
> In North America we have inadvertently extirpated huge numbers of these native stocks of freshwater fishes. Damage has been especially severe among the salmonoids. In effect, we have cancelled the policies of some valuable taxa and forced others into bankruptcy. We need all the remaining native stocks of salmonoids we have left, for both conservation and practical management purposes.
>
> Stock development is favoured by isolating parts of populations in unusual or unique environmental situations. The Tutizzi Lake species assemblage is just such an unusual situation. Here several economically important salmonoids encounter each other that cannot do so throughout nearly all the rest of their natural range. The opportunity for unique stock development is obvious."

TUTIZZI'S FUTURE

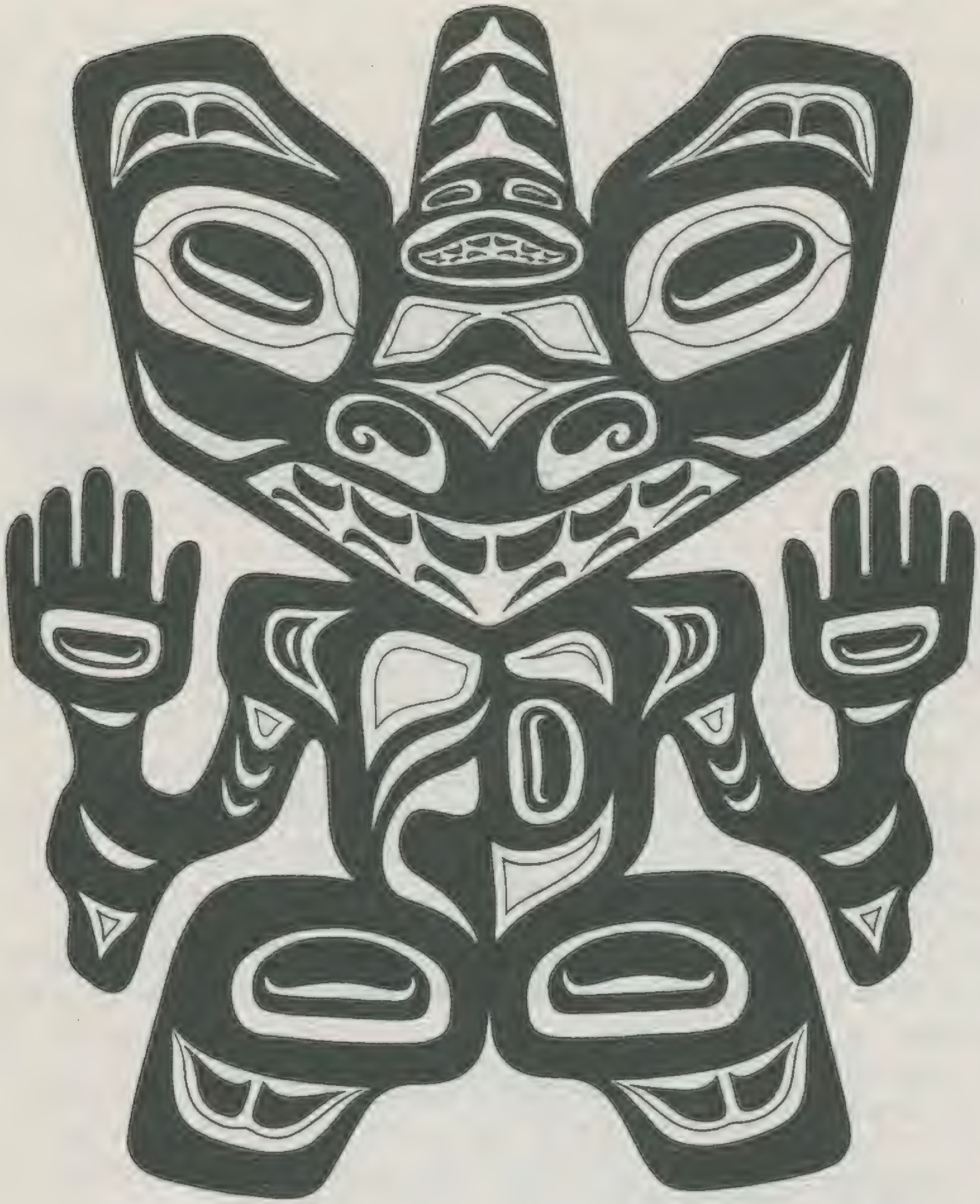
In exchange for considerable land lost to the construction of the Bennett Dam on the Peace River, in the mid-1970s, my father gained a small piece of deeded land on Tutizzi Lake. Over the past ten years, my family has worked to gain formal protection for the lake and its watershed. In 1990, my family hired the services of a professional forester to draw up a formal wilderness proposal and to conduct a cost-benefits analysis of timber harvesting versus the long-term wilderness tourism value of Tutizzi. The analysis showed that the value of wilderness tourism is clearly far greater than harvesting the alpine and subalpine timber and then hauling and barging it more than 200 kilometres to the mills in Mackenzie.



The Arctic grayling occurs in cool, generally clear waters of northwestern North America. Adults feed mainly on aquatic and terrestrial insects. They spawn in spring, generally when the ice is breaking up in small streams. The dorsal fin is especially large in the male, dark and resplendent with a mauve and blue banded edge and vertical rows of orange-red or mauve to emerald.

Not only would clear-cutting destroy the wilderness and aesthetic character of the area, but it would also open it to general access. Increased fishing pressure on this relatively high-elevation, low-production lake could alter the fish composition considerably. Clear-cutting could also silt the fish-spawning beds and alter the functioning of the entire watershed.

Agreements with the timber operator have staved off logging over the past ten years. Although Tutizzi is now on B.C.'s short list for possible protection, its is also back on the list for clear-cutting, beginning in 1994.



Totem:

Haida Bear with dance hat.

This drawing is based on a Haida design of a bear with dance hat, which is a family emblem or totem for a particular Haida chief. The number of segments in the hat show the chief's rank. At the bottom, designed in reverse shape, is a tail that represents the flukes of a sea-bear.

Note the rhythmical repetition of angles where the body parts meet, and also, the use of circular or ovoid lines and curves against straight lines so that each can work against the other. The native cultures show respect for our close relationship to the earth by combining nature with anthropomorphic forms.

[Roelof Idema]

CHARTER FOR INDKNOW

Indigenous Knowledge System List

Submitted by:
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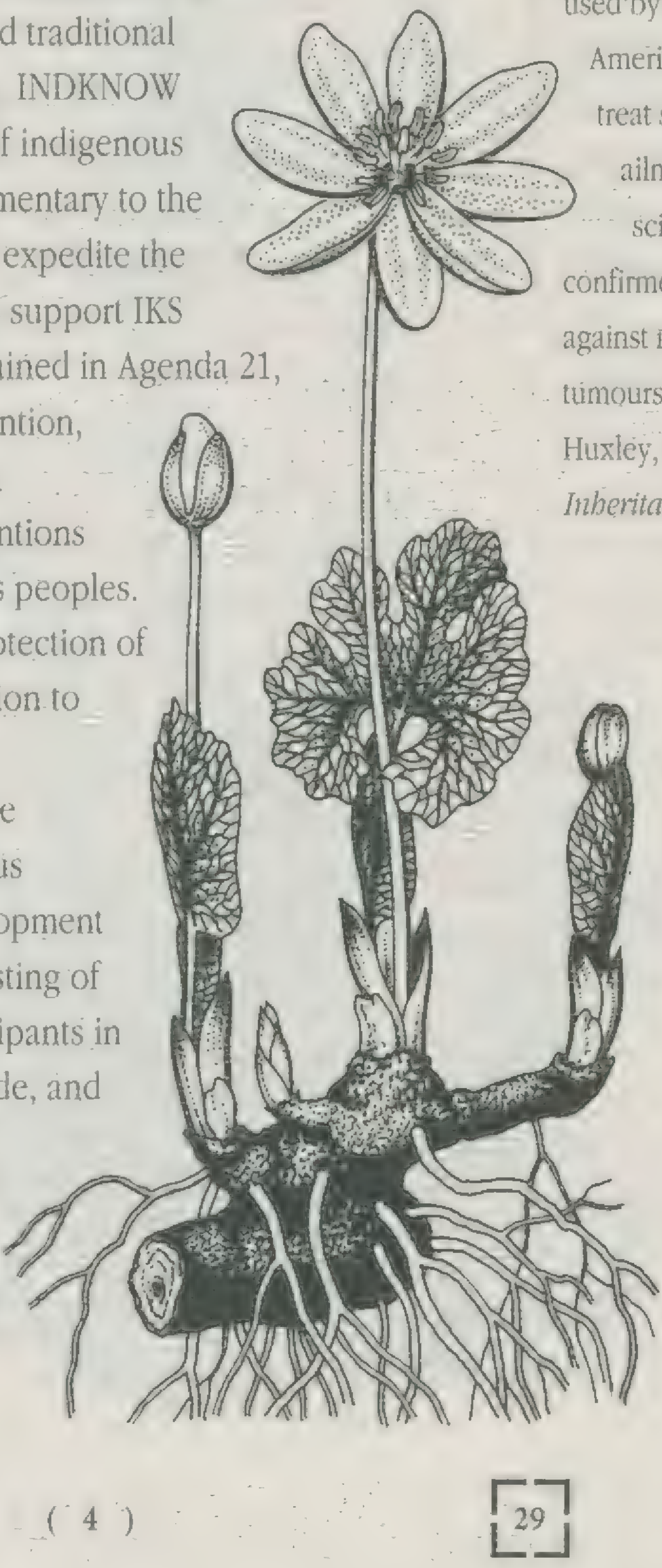
INDKNOW Charter 1

The world has suffered and continues to suffer from a profound loss of indigenous peoples and rural groups and their knowledge about the natural world constructed from their intimate ties to land and place. This loss has been accompanied by neglect and the marginalization of their practices and beliefs, often figured as inferior forms of knowing to be replaced by universalized knowledge derived from the Western scientific tradition.

While the latter tradition has great beauty, power, and utility, in many cases, attempts to apply it universally without regard for traditional knowledge systems have led to failures in sustainable resource use and the erosion of biological diversity. The imposition of scientific management regimes without the participation of local communities and the incorporation of their knowledge systems has also contributed to the weakening and destruction of traditional religious, political, and social structures, which have great beauty, power, and utility in their own right. This has prompted debate on whether the neglect of traditional knowledge violates human rights, civil rights, and indigenous rights.

In recognition of these issues, there is a dramatically growing national and international interest in incorporating indigenous knowledge systems (IKS), including traditional ecological knowledge (TEK), into truly participatory approaches to development. Communities are now recording their knowledge for use in their own educational systems and planning processes. To promote IKS, grassroot networks of indigenous and rural communities are emerging, and national institutions now regard IKS as an invaluable national resource. Finally, the development community is now designing projects that emerge from problems identified and given priority by the beneficiaries themselves. These projects build upon and strengthen community-level knowledge systems and organizations.

INDKNOW@uwavm.u.washington.edu is a forum for discussing issues associated with indigenous knowledge systems and traditional ecological knowledge. INDKNOW will carry notices about publications, projects, ideas, and questions from individuals and groups working to understand, validate, and apply indigenous knowledge systems and traditional ecological knowledge. INDKNOW will promote the use of indigenous knowledge as complementary to the scientific tradition and expedite the obligations of States to support IKS under provisions contained in Agenda 21, the Biodiversity Convention, and other international agreements and conventions applying to indigenous peoples. It will work for the protection of IK and just compensation to communities for their knowledge, support the international Indigenous Knowledge and Development (IK&D) network consisting of more than 2,500 participants in 106 countries worldwide, and finally, facilitate the growing number of formally established indigenous knowledge resource centres.



Sanguinaria canadensis, commonly known as bloodroot, is usually found in the deciduous forests of eastern and mid-western North America where it blooms in early spring."The dainty little Bloodroot, so called because of the red juice that flows from the cut roots, was used by North American Indians to treat several ailments. Modern science has confirmed its value against malignant tumours." (Anthony Huxley, *Green Inheritance*)

The rosy or Madagascar periwinkle *Catharanthus roseus* (L.), a member of the dogbane family, Apocynaceae, is native to the dry forests of Madagascar. Drugs derived from this small rose-coloured flowering plant save hundreds of children each year from leukemia. For more on the rosy periwinkle, see *Canadian Biodiversity* 2 (4): 8-9

INDKNOW Charter 2

Appropriate discussions on INDKNOW include:

- the scope of intellectual property rights or other property rights regimes concerning the protection of traditional knowledge,
- methods for compensating peoples for sharing their knowledge and for protecting them against unfair exploitation,
- the relation of traditional ecological knowledge to the preservation of cultural and biological diversity,
- failures of traditional practices to maintain ecosystem health and meet human needs,
- methods and ethics for investigating indigenous knowledge,
- the role of community involvement in using indigenous knowledge for sustainable development,
- the relationships between traditional knowledge and the Western scientific tradition (e.g.: ethnomedicine, ethnobiology, ethnobotany, ethnozoology, ethnoecology, agroecology, natural forest management, etc.) and their complementary use for planning and decision-making,
- the use of indigenous knowledge in sustainable development,
- the close involvement of local communities with development planning,
- the development of formal and non-formal education systems for the transmission of traditional knowledge, and
- strategies for empowering local communities and indigenous peoples to strengthen and incorporate their own belief systems into their self-determined development.

The investigation of indigenous knowledge is contentious because it involves local belief and knowledge that may be sacred or belongs privately to a particular group. It is not the intention of this list to reveal such knowledge. As such, subscribers should not post details of practices that are not already published or are generally known, that are sacred or private, that involve potentially patentable or commercially exploitable concepts, or that are offered without the informed consent of the originators of such knowledge until generally acceptable methods of compensation are worked out.

Furthermore, the list should not be used for notices about indigenous and rural political struggles, action alerts for halting abuses of human rights or for the discussion of primarily spiritual beliefs. While the ability to practice traditional practices and beliefs relies closely on land rights and cultural rights, these issues are covered in detail by NativeNet (a set of electronic conferences sponsored by the South and Meso American Indian Information Center (SAIIC) and Gary Trujillo, which are carried on the APC network, as an electronic mailing list, and as a Usenet list. Contact Gary S. Trujillo, gst@gnosys.svle.ma.us) and in conferences on the APC network. (For information, send a blank e-mail message to econet-info@igc.apc.org) We encourage people to subscribe to and follow the important discussions there.

INDKNOW Charter 3

To subscribe to the INDKNOW list, send a message to:

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You will be sent a message on how to send messages to the list members (indknow@uwam), and how to communicate with the list software (listserv@uwavm) in order to subscribe and unsubscribe, hold your mail when away from your mailbox, make your subscription to the list private if you wish, get archives of past messages, retrieve a list of open subscribers, and other automated functions.

This list is facilitated by the Center for Indigenous

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The *Aloe vera*, a member of the Liliaceae family and originally native to Africa, has been illustrated from the artist's specimen collection. It was brought into Canada from the Turks and Caicos Islands in 1974. The natives there, and throughout the Caribbean, regularly eat the plant or purchase its gel to ease upset stomachs and promote intestinal regularity. It is also famous for its ability to speed the healing of burned skin, and in the 1980s, it became popular in North America in skin creams and shampoos. This plant is a good example of an ancient medicinal plant now widely accepted in "modern" society.

Biodiversity News Notes

ASC/SPNHC to hold joint meetings

The Association of Systematics Collections (ASC) and the Society for Preservation of Natural History Collections (SPNHC) will have a joint meeting at the Missouri Botanical Garden 11-15 May 1994. The theme for the meeting is "Collections Planning and Policies." The meeting will include a joint workshop, a public policy review, SPNHC technical sessions, and a training workshop. Program information and registration materials will be sent to members and included in upcoming issues of both the ASC Newsletter and the SPNHC Newsletter. For further information contact ASC, 730 11th Street, NW, Second Floor, Washington, D.C. 20001-4521, or telephone (202) 347-2850.

President Clinton supports increasing availability of family planning

In an address to the United Nations, 27 September 1993, the American President, William J. Clinton, advocated increased support for family planning. President Clinton said, "And to ensure a healthier and more abundant world, we simply must slow the world's explosive growth in population. We cannot afford to see the human waste doubled by the middle of the next century. Our nation has, at last, renewed its commitment to work with the United Nations to expand the availability of the world's family planning education and services. We must ensure that there is a place at the table for every one of our world's children. And we can do it." This address gives hope that funding will be restored for programs that provide family planning information and services to those women who want it. Many of the world's mothers wish to space out their children or to limit their family size, but lack the needed resources. Under the previous U.S. administration, support for family planning was reduced.

The Biodiversity Convention gets a new Interim Secretariat

A team of seven specialists from around the world has been appointed by Elizabeth Dowdeswell, Executive Director of the United Nations Environment Programme (UNEP), to the Interim Secretariat of the Convention on Biological Diversity.

Heading the group is Angela Cropper, economist and lawyer from Trinidad and Tobago. Her experience with international conventions includes four years with the Caribbean Community Secretariat and participation in numerous intergovernmental negotiating bodies, both as a government delegate and as a representative of a major non-governmental organization. She is joined by Dr. Arturo Martinez, a biologist from Argentina; Dr. Kalemani Mulongoy, a biotechnologist from Zaire; Susan Bragdon, a lawyer from the United States; Manab Chakraborty, an economist from India; Song Li, a financial instruments specialist from China; and Lone Johansen, a communications specialist from Denmark. For more information contact: Lone Johansen, Communications, Interim Secretariat, Convention on Biological Diversity, Geneva, Switzerland, telephone: (41-22) 979-9365, fax: (41-22) 797-2512.

Sowing Seeds for Change in Ethiopia

A public forum on preserving the diversity of food-producing seeds and promoting environmentally sound farming in Ethiopia was held 7 October 1993 at the Canadian Museum of Nature, Ottawa, Canada. Ethiopia is one of the places where human civilization and agriculture began. It is also the home to the world's most important seed crops, such as durum wheat. The forum featured a talk by Dr. Melaku Worede, slides of Ethiopian farms and living seed banks, and a panel and public discussion. The panel included Ms. Anne Macey, organic farmer, Dr. Julian Inglis, executive director of the Museum's "Centre for Traditional Knowledge," and Dr. Don E. McAllister, Senior Biodiversity Advisor of the Museum's "Canadian Centre for Biodiversity."

Dr. Worede is internationally renowned for his pioneering research in plant genetics and his work in restoring Ethiopia's food security. Not only is he currently the Chair of the United Nations' "Food and Agriculture Commission on Plant Genetic Resources," he has received the Right Livelihood Award (also referred to as the alternate Nobel Prize) for his achievements in genetic research. Dr. Worede played a key role in launching the Unitarian Service Committee of Canada's "Seeds of Survival Program" in Ethiopia in 1988. This program works with Ethiopian scientists and farmers to preserve and promote the use of hardy local seeds that produce harvests without the use of expensive chemical inputs. In turn, these traditional seeds supply world agriculture with the genetic material to develop new seed strains. The program has a central seed bank and local seed banks in which local varieties are kept growing under their natural conditions. The public forum was co-sponsored by Unitarian Service Committee-Canada and the Canadian Museum of Nature.

E.O Wilson, biodiversity scholar, named the 1993 Henry Shaw Medallist

Dr. Edward O. Wilson, the Frank B. Baird, Jr. Professor of Science and Curator in Entomology, Museum of Comparative Zoology at Harvard University, was awarded the Henry Shaw Medal at the Missouri Botanical Garden's annual Henry Shaw Dinner, 16 November 1993. Wilson was being honoured for his leadership role in focusing international attention on issues surrounding biodiversity.

The world-renowned scientist and award-winning author was recognized for his extensive studies in evolutionary biology, the classification of social insects, and biogeography. Wilson's work has taken him from the controversial sociobiology forefront to ant collection trips in South American tropical rain forests.

In addition to dozens of awards and 13 books, Wilson is the two-time recipient of the Pulitzer Prize for *On Human Nature* (1979), and *The Ants* (1991). In 1992 he published the well-received book *The Diversity of Life*. He received the National Medal of Science in 1977 for his studies in sociobiology, as well as the Crafoord Prize from the Royal Swedish Academy of Sciences in 1990. He is a member of the Board of Directors of the New York Botanical Garden and the World Wildlife Fund.

"Edward Wilson is one of the world's leading advocates of the need for understanding and preserving biodiversity," said Peter H. Raven, Director of the Missouri Botanical Garden. "His extraordinary studies of social insects, especially ants, his development of the field of sociobiology, and his most recent book, The Diversity of Life, clearly illustrate his impact on the world of scholarship and public perception of science and his appreciation of the environment."

China bans medical use of rhinoceros horn and tiger bones

In June 1993, the State Council, China's highest government body, announced that rhinoceros horns and tiger bones would no longer be legal in traditional scientific medicines. The buying, selling, or transporting of these animal products is to be phased out over the next six months. The trade in these items is a contributing factor to population declines and species extinction, with even Canada supplying bear parts for some Chinese medicines. [From Legislative Newsletter, Animal Alliance of Canada, July/August 1993, p. 2].

ETI Biodiversity Bank publishes CD-ROM on the birds of Europe

Funded in 1991 by the Netherlands Government, the University of Amsterdam, and UNESCO, the Expert Centre for Taxonomic Identification (ETI) has published its first taxonomic CD-ROM featuring 419 species of European birds. Its aim is to preserve and disseminate taxonomic data by creating a standard format for storing species information, which allow easy exchanges between data banks in the future. More CD-ROMs are in the works and will be based on information compiled by working groups on special themes: for instance, ETI intends to publish a CD-ROM, containing about 1250 species, on the pelagic fishes of the North-east Atlantic and Mediterranean. The CD-ROMs will be made available in the main formats now in use: Macintosh and IBM. For more information contact: ETI, P.O. Box 4766, NL-1009 AT Amsterdam, Netherlands, Fax: (31-20) 525-7238. [From *CEPNEWS* 7(3): 9].

NSF announces guidelines for the Biotic Surveys and Inventory Program

The U.S. National Science Foundation (NSF) has announced guidelines for the Biotic Survey and Inventory Program as part of its commitment to studying and understanding biological diversity. The goal of the Program is to foster an assessment, understanding, and record of the diversity of life on Earth, past and present. A better understanding of biodiversity is essential for research in many other fields, such as systematics and population biology, ecology, conservation, anthropology, economics, and resource management.

The Program will host an annual Biotic Survey and Inventory Program competition to support a wide range of research activities. These activities could include collecting organisms as samples of populations and species; conducting surveys of the taxa of a region and also, of inventories of existing collections; producing species lists; catalogues, identification manuals, and/or keys; and developing databases of the specimens and taxa for use in later studies.

The annual deadline for the submission of proposals is October 15. Proposals should be prepared according to the guidelines presented in "Grants for Research and Education in Science and Engineering," and specific program guidelines can be obtained from: Biotic Survey and Inventory Program, Room 215, 1800 G Street, N.W., Washington, D.C., U.S.A. 20550, by telephone: (202) 357-7475, fax: (202) 357-1191, or e-mail: Ikrishta@nsf.gov

Countries wishing to launch their own biotic surveys and inventories and taxonomic research may wish to investigate this program. [Source: ASC Newsletter 21(3): 33-34].

World Wildlife Fund issues Canada its annual report card

With 0.4 hectares (one acre) of Canada's wilderness disappearing every 15 seconds, World Wildlife Fund Canada (WWFC) issued an urgent appeal for the federal, provincial, and territorial governments to pick up the sluggish pace of their wilderness protection efforts. The appeal came at simultaneous news conferences across the country as WWFC and its regional conservation partners released the Fourth Annual Endangered Spaces Report.

The Report assigned a grade of "D" to the Government of Canada for its failure to protect marine areas, but the federal government did earn a "B" for its work in Yukon, a cooperative accomplishment with aboriginal peoples. Overall the provinces and territories fared better. Prince Edward Island and British Columbia were given a high of "B+"; Manitoba and Ontario, "B"; New Brunswick, Quebec, and Saskatchewan, "B-"; Newfoundland, "C+"; Alberta, Northwest Territories, and Nova Scotia, "C"; and a low of "D+" for the Yukon.

"The completion of Canada's protected areas system is now public policy in Canada," said Monte Hummel, President of WWFC. "But government rhetoric has failed to generate enough measurable acres of new protected area this year. While there are significant achievements including Vuntut, the Tatashenshini Wilderness Area in B.C. and increased protection for the Cape Churchill Wildlife Management Area in Manitoba, we are still moving far too slowly if we hope to hold on to a representative sample of Canada's natural diversity."

The Endangered Spaces Report measures progress by Canada's senior governments in protecting the country's natural heritage and meeting the goal of the Endangered Spaces Campaign. Launched in 1989, the campaign is working to ensure that a representative sample of each of Canada's 434 natural regions is protected from industrial use by the year 2000. The provincial, federal, and territorial governments all endorsed this goal at the Tri-Council Meeting on Protected Areas in Aylmer, Quebec on 25 November 1992. In the recent federal election the Progressive Conservative, Liberal, N.D.P., and Bloc Québecois parties all affirmed their support for completing a representative network of protected areas by the turn of the century. The Reform Party did not respond to WWFC's questionnaire.

To date, less than 10% of Canada's natural regions have been fully represented with protected areas, and currently only 4.8% of Canadian lands and waters are protected from development, a scant improvement on last year's figure of 4.6%. Achieving the Endangered Spaces goal will require protecting areas in more than 50 natural regions each year through to the year 2000. Meeting the Endangered Spaces goal in this way should result in at least 12% of the country being set aside as protected areas—a target for all countries established by the United Nations.

With the release of the Endangered Spaces Report, WWFC also distributed a companion document titled *The*

Economic Benefits of Conserving Canada's Endangered Spaces. A Discussion Paper, entitled *Protected Areas and Aboriginal Interests in Canada* and released by WWFC in 1993, signals the potentially important role that the settlement of aboriginal land claims will have in the completion of Canada's network of protected areas.

Recycle pallets—save hardwood forests!

Over 50% of Eastern U.S. hardwoods are used for pallet manufacturing, according to testimony of F. Dale Robertson, Chief, USDA Forest Service, who was testifying before a Subcommittee of the Committee on Appropriations, 102nd Congress. Of the more than 530 million American wooden pallets produced each year, 57% are used only once. Recycling pallets could save hundreds of thousands of trees. [From *Clearinghouse Bulletin* , Carrying Capacity Network 3(1): 5].

ASC prepares Planning and Policy Guidelines for natural history collections

The Association of Systematic Collections (ASC) was awarded a U.S. Institute of Museum Services grant to prepare a set of institutional planning and policy guidelines for natural history museums and herbaria. The goal of this project is to promote professional standards for museum operations among these institutions, and to provide better assistance, support and information about institutional responsibilities and policy needs.

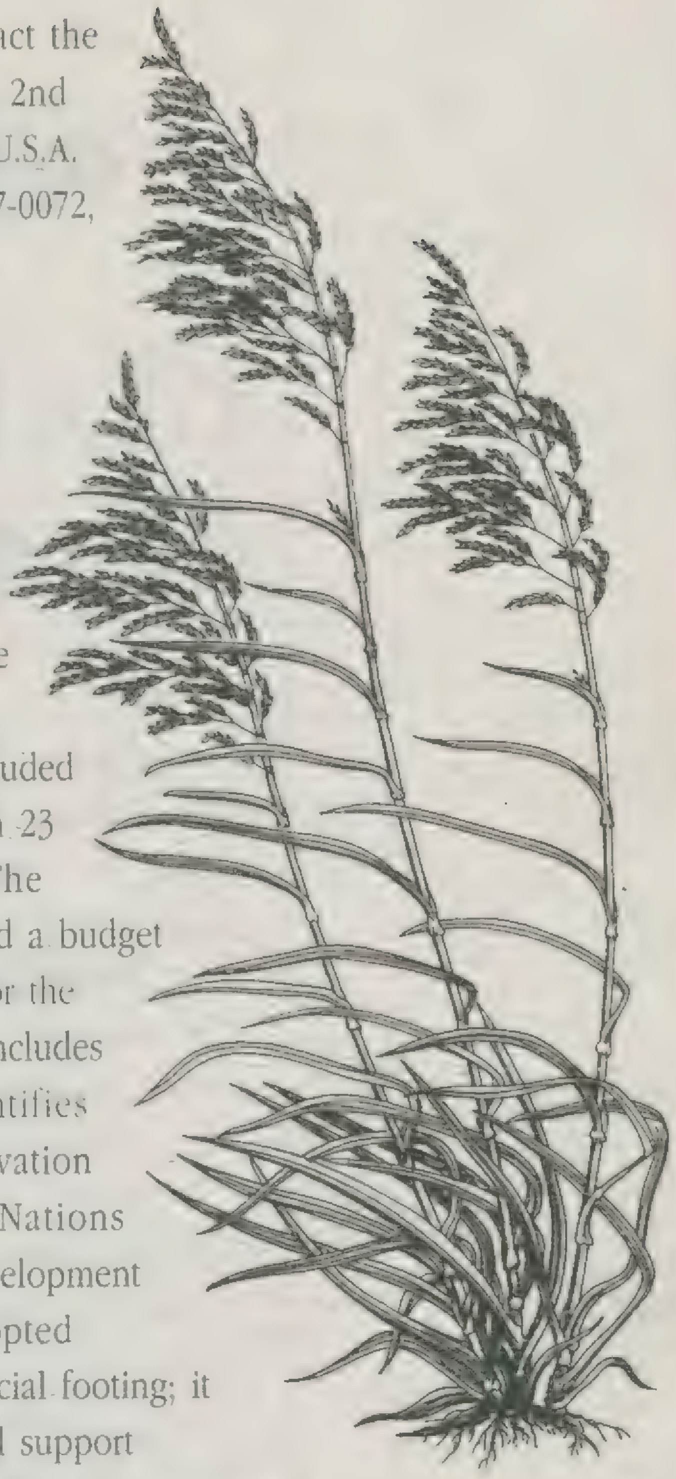
To accomplish this goal, ASC is distributing detailed surveys to its member institutions requesting information on collections policies and strategic plans. ASC also is compiling data on the status and needs of natural history collections. Information from both surveys will be analyzed, and then the results will be used to determine the nature and scope of policy guidelines currently in existence, and the areas where such guidelines are needed. A Planning and Policy Guidelines Committee, organized by ASC, will review the survey analysis and the draft guidelines.

At its 1994 annual meeting, a half-day workshop will be conducted to review the project's work to date, to outline a standard set of policies and alternatives, and to explain the issues and rationales behind them. The results of the session will be further refined and published as part of the ASC's policy series, and will form the basis for ASC's ongoing assistance with natural history institutions.

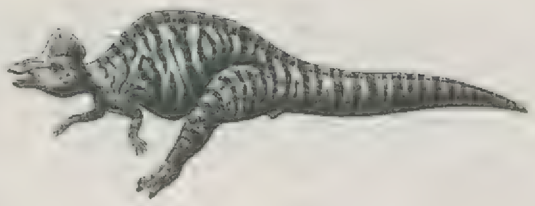
For further information, please contact the ASC office at 730 11th Street, N.W., 2nd Floor, Washington, D.C. 20001-4521 U.S.A. Phone: (202) 347-4060, fax: (202) 347-0072, e-mail: mnhas001@sivm.si.edu

Fifth Meeting of the Ramsar Convention Parties was held at Kushiro, Japan

The Fifth Meeting of the Parties to the Ramsar Convention was held in Kushiro, Japan in 1993. Attendees included 1,217 registered delegates along with 23 Observer States and 104 NGOs. The parties agreed on a new program and a budget doubled to SFr 2,225,00 per annum for the next triennium. The new program includes the Kushiro Statement, which identifies global priorities for wetland conservation action, following the United Nations Convention on Environment and Development conference in Rio. The budget adopted puts the Convention on a solid financial footing; it will also allow for increased technical support for developing countries and will strengthen the activities of the Secretariat. A 17-minute video that was produced under Ramsar guidance by NHK Hokkaido Vision explains the concept of wise use of wetlands. It includes footage of a mangrove management program in Costa Rica, which helps local people to produce charcoal more efficiently, and thus, reduces pressure on the forest. Also featured is a Vietnam Red River delta project to reforest the Melaleuca forests damaged by war and unrestricted logging. New Ramsar publications launched at Kushiro include: *A directory of wetlands of international importance* in four volumes; *The Ramsar Convention on wetlands: Its history and development; A directory of wetlands in Australia*; and *A directory of wetlands in Oceania.* [from *Ramsar Newsletter* Number 16, August 1993].



Drooping wood reed; also, nodding wood grass *Cinna latifolia*



Biodiversity Meetings

8-11 APRIL 1994

II North-European Symposium on the ecology of small and medium-sized carnivores, to be held in Tvärminne, Finland.

Contact: Kaarina Kauhala
Finnish Game and Fisheries Research Institute,
Game Division
P.O. Box 202, SF-00151
Helsinki, Finland

11-13 APRIL 1994

International Conference on Wetland Archaeology and Nature Conservation, to be held in Bristol, UK.

Contact: Dr. Margaret Cox, Dept for the Environment
Somerset County Council, County Hall
Taunton, UK
TA1 4DY

20-22 APRIL 1994

1994 Canadian Institute of Geomatics Conference.

Contact: Pierre Paquette
Communications Officer,
Dept of Fisheries & Oceans
867 Lakeshore Rd., P.O. Box 5050
Burlington, ON L7R 4A6
Canada
Tel: (416) 336-6240
Fax: (416) 336-4819

15-18 MAY 1994

Ecology and Evolutionary Ethology of Fishes, to be held in Victoria, B.C.

Contact: Dr. Craig Hawryshyn
Dept of Biology, University of Victoria
Victoria, B.C.
Canada V8W 2Y2

16-20 MAY 1994

Second International Conference on Science and the Management of Protected Areas, to be held in Halifax, N.S., Canada. Theme: Ecosystem Monitoring and Protected Areas.

Contact: Neil Munro
Director, Policy Planning and Research
Canadian Parks Service, Environment Canada
Historic Properties, Upper Water Street
Halifax, NS
Canada B3J 1S9
Fax: (902) 426-7012

17 MAY 1994

Biodiversity: Challenges and Solutions, 62nd Conference of the ACFAS (French Canadian Association for the Advancement of Science). To be held at the University of Québec at Montréal.

Contact: Patrick Paré
FOSEM
(Foundation for the Safeguard of Endangered Species)
Tel: (418) 622-0313
Fax: (418) 646-9239

24-27 MAY 1994

North American Benthological Society 42nd Annual Meeting, to be held in Orlando, FL, USA

Contact: Dr. Nick Aumen
S. Florida Water Management District
P.O. Box 24680
West Palm Beach, FL 33416-4680
U.S.A.

12-14 JUNE 1994

International Summit on Environmental Assessment: Evaluating Practice to Improve Performance

Contact: Patrice Leblanc, Director General
Policy and Process Development
Federal Environmental Assessment Review Office
200 Sacré-Coeur Boulevard
Ottawa, ON K1A 0H3
Tel: (819) 997-2253
Fax: (819) 994-1469

13-18 JUNE 1994

International Charr Symposium, to be held in Trondheim, Norway.

Contact: Secretariat, International Charr Symposium 1994
c\o: NINA, Tungasletta 2
N-7005 Trondheim
Norway

19-25 JUNE 1994
Fifth Symposium of the International Association for Genetics in Aquaculture, to be held at Dalhousie University, Halifax, NS, Canada

Contact: Pamela Gaines
Marine Gene Probe Laboratory
Biology Department
Dalhousie University
Halifax, NS B3H 4J1
Tel: (902) 494-1398
Fax: (902) 494-3736

22-26 JUNE 1994
Sustaining the Earth Summit: Planting a New Vision of Sustainable Agriculture, to be held in Minneapolis, MN

Contact: International Alliance for Sustainable Agriculture (IASA)
701 University Avenue SE
Minneapolis, MN 55414, USA
Tel: (612) 331-1099
Fax: (612) 279-1527

25 JUNE-3 JULY 1994
Global Forum '94.
Theme: Cities and Sustainable Development, to be held in Manchester, UK

Contact: Global Forum '94
P.O. Box 532, Town Hall
Manchester, UK M6O 2LA
Tel: (44-61) 234 3741
Fax: (44-61) 234 3743
E-mail: Internet: GF94-CENTRE@mcr1.geonet.de

■ ■ ■

Book and Periodical Niche

Putting biodiversity on the map: Priority areas for global conservation.

C.J. Bibby, N.J. Collar, M.J. Crosby, M.F. Heath, Ch. Imboden, T.H. Johnson, A.J. Long, A.J. Stattersfield,and S.J. Thirgood. 1992. The International Council for Bird Preservation, The Burlington Press, Cambridge, UK. 90 pp., illus. soft cover, ISBN 0-946888-24-8. £12.50/$23.50.

If the old adage be true that "a picture is worth a thousand words," then this beautifully illustrated book, replete with colour photographs, diagrams, charts, and maps, certainly contains more than its 90 pages would suggest. The authors have identified 221 Endemic Bird Areas (EBAs) worldwide, or areas of natural groupings of bird species that are restricted to a specific range. Because birds occur in most habitats on land throughout the world, it was thought that they would be good indicators of areas sensitive to environmental change. Therefore, the mapping of these EBAs was undertaken along with a review of the literature in an attempt to assess the value of birds as biodiversity indicators. Their results demonstrate that these EBAs or hotspots of bird diversity are likewise generally important areas of plant, mammal, reptile, amphibian, mollusc, and insect biodiversity, although other North American studies show the hotspots for vertebrate classes often do not coincide.

As might be expected, 76% of all EBAs occur in the tropics with very few at northern temperate latitudes. Indonesia alone accounts for the largest number of EBAs with 411 restricted-range species of which 339 are endemic.

The authors stress early in the report that the bird data presented are but a beginning on which further detail must be added. There is an urgent need to provide

The resplendent quetzal on page 39 is one of about 35 species from the family Trogonidae. Widely spread throughout Central and South America, these brightly coloured birds were the sacred bird of the ancient Mayans and Aztecs. Today it is the national emblem of Guatemala, whose monetary unit is...the quetzal. Most trogons are 24-46 cm (9.5 to 18 inches) in length, but *Pharomachrus mocinno* is an exception. From the top of its crest to the tip of its tail feathers, it measures 125 cm (50 inches)! A forest dweller, the quetzal eats insects and spiders and is reputedly fond of a fruit of a tree related to an avocado.

similar data and mapping for other taxonomic groups and to refine the study to allow precise recommendations for specific action and to provide conservation within these areas.

The publication sets an example of what needs to be accomplished to quantitatively identify global hot spots of diversity and how these data may be used to evaluate priorities for action.

David M. Jarzen, Research Scientist,
Canadian Museum of Nature

Accounts overdue: Natural resource depreciation in Costa Rica.

Raúl Solórzano, Ronnie de Camino, Richard Woodward, Joseph Tosi, Vicente Watson, Alexis Vásquez, Carlos Villalobos, Jorge Jiménez, Robert Repetto, and Wilfrido Cruz. The Tropical Science Center, San José, Costa Rica and The World Resources Institute, Washington, D.C. 1991. 110 p. ISBN 0-915825-66-X.

This publication reports on the detailed natural resource depreciation of Costa Rica, including forest, soil, fishery and mangrove/coastal resource accounts. This thorough analysis from 1970 to 1989 includes numerous tables, charts, line drawings, and maps providing valuable information and formulae used in the calculations. Annexes contain further calculations for timber volumes, soil depreciation, land unit types, and nutrient loss, as well as comprehensive references. The study shows that Costa Rica's forests, soils, and fisheries depreciated by more than US$4.1 billion in two decades. The national accounts during those years had created the illusion of income development when, in fact, national wealth (natural resources) was being destroyed.

Spanning a 20-year period of investigation, the authors realized that although Costa Rica's natural resources were disappearing with increasing speed, policy-makers could reverse the situation by enacting corrective environmental and economic policies. This will only happen when the information provided to policy-makers is a *genuine reflection* of the relationship between economic development and the natural environment.

The most valuable section of this publication is in Part I, which consists of the Overview and Recommendations. The authors, while analyzing the changing state of Costa Rica's natural resources, realized that the "yardstick for measuring economic performance" in all countries—the United Nations System of National Accounts (UN SNA)—was an inaccurate framework for appraising "sustainability of economic growth in calculating environmental threats." In the UN SNA, the contributions from natural resources were not treated as tangible assets; and when natural resources were used beyond their capacity to recover, they were not recorded in income and investment accounts.

This Costa Rican natural resource accounting study represents a substantial advance in methodology and data over previous efforts. The 1991 publication of this report was a timely contribution to the June 1992 meeting in Brazil of the UN Conference on Environment and Development in that the report recommended that the distortion in the treatment of natural resources as in the SNA be removed in future revisions.

Susan A. Jarzen, Volunteer, Canadian Museum of Nature

Environnement. Sommaire de la documentation courante.

Les Publications du Québec, C.P. 1005, Québec G1K 7B5, Canada. Tel.: (418) 643-5150 or 1-800-463-2100, Fax: (418) 643-6177. Annual subscription: $90.00.

Published by the **Centre de documentation et de renseignments of Quebec**, this bulletin is intended to help keep the reader up to date on environmental publications. It reports new acquisitions of the Centre including publications of the Ministry of the Environment, on international congresses and conferences, and summarizes 200 environmental periodicals. The annual subscription rate, which includes 10 issues, is $90 for one year and $160 for two years; individual numbers sell for $9.95.

A coming of age: Policy for wetland conservation in Canada

By Pauline Lynch-Stewart, Clayton D.A. Rubec, Kenneth W. Cox, and James H. Patterson. 1993. North American Wetlands Conservation Council (Canada) Report No. 93-1, Suite 200, 1750 Courtwood Crescent, Ottawa, Ontario K2C 2B5, Canada. (613)228-2601
57 pp. (Également disponible en français).

This report provides a snapshot of wetland policy initiatives in Canada, as of January 1993, and explores some of the factors that influenced this evolution. It is designed to facilitate and promote the development, adoption, and implementation of wetland policies. [Authors' Preface].

A field guide to the families and genera of woody plants of northwest South America (Columbia, Ecuador, Peru), with supplementary notes on herbaceous taxa.

By Alwyn H. Gentry. 1993. Conservation International, Washington, D.C. Soft cover, 895 pp., 291 illustrations. ISBN 1-881173-00-3. U.S.$25 + $5 for postage and handling. Available from: Department of Conservation Biology, Conservation International, 1015 18th Street NW, Suite 1000, Washington, D.C., U.S.A. 20036.

As concern grows over the state of tropical forests, the appearance of this book is timely. There is a great need for manuals to identify tropical woody plants, which help identify areas rich in taxa for protection. Taxonomic guides help ecologists understand the variety of life they are studying. This is the first field guide to deal with the diverse flora of Colombia, Ecuador, and Peru, and all families that contain woody, epiphytic, or scandent species in these regions are included. The guide includes an extensive key to the families, which takes the user through the most relevant character states and possible taxonomic outcomes. An account for each family includes characteristics useful for recognizing that family; and for most families, each genus is listed with a few of its most outstanding species. Generic listings indicate the number of Neotropical species, and common names are included for many of them. In addition, most woody genera are illustrated. Indexes for common names and scientific names, and a listing of all the figures are included. This book should be a great tool for conservationists and field biologists. A subsidy enables it to be offered at a low price.

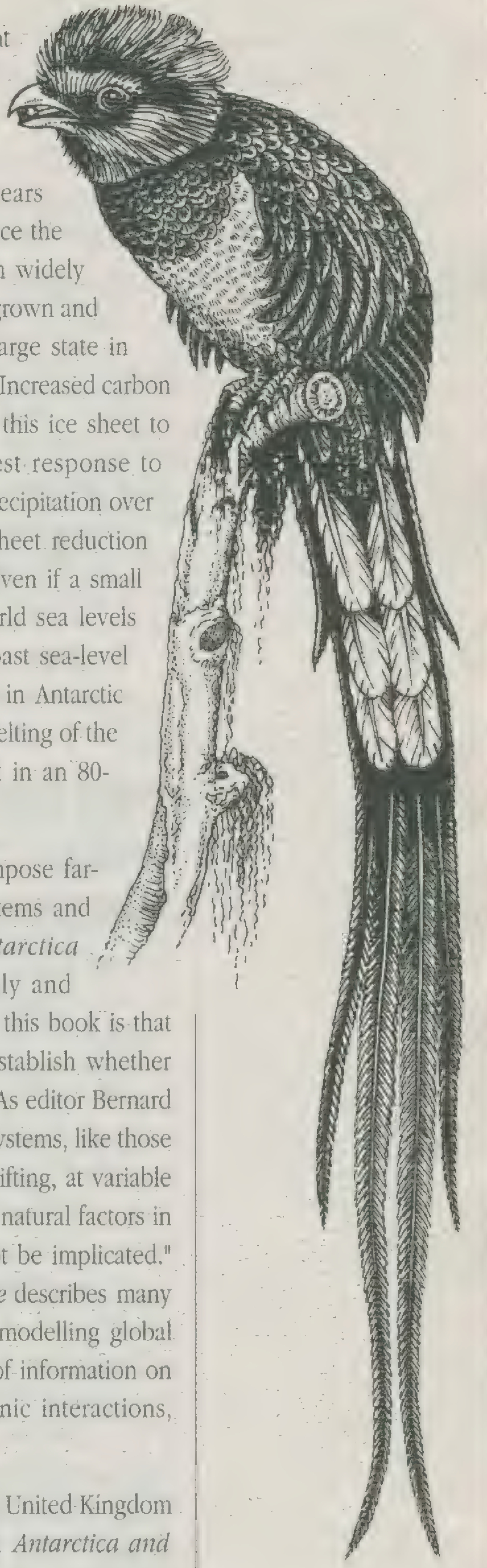
Antarctica and global climatic change

Edited by C. M. Harris and B. Stonehouse. 1991. Belhaven Press, London. xv+198 pp. ISBN 1-85293-1876.

Over the last 90 years fossil-fuel burning and deforestation have raised global carbon dioxide levels by 30%. By the year 2030, at the present emission rates, carbon dioxide levels will be in excess of any the earth has experienced since the period of the Pleistocene ice ages over 2 million years ago. For 36 million years (at least), since the earliest Oligocene, Antarctica has been widely glaciated. Since then the ice sheet has grown and decayed, developing into its present large state in the latest Pliocene or early Pleistocene. Increased carbon dioxide and temperatures could return this ice sheet to its Pliocene size. The Earth's earliest response to climate warming would be increased precipitation over the next 100 years, followed by ice sheet reduction over the next 1,000 to 10,000 years. Even if a small proportion of the ice sheet melted world sea levels would rise catastrophically. Indeed, past sea-level changes have been related to changes in Antarctic temperature and glacial ice volumes. Melting of the entire Antarctic ice sheet would result in an 80-metre rise in global sea level!

With the potential for Antarctica to impose far-reaching effects on global climate systems and environments, the publication of *Antarctica and Global Climatic Change* is timely and relevant. The consensus of opinion in this book is that there are too many uncertainties to establish whether global warming is affecting Antarctica. As editor Bernard Stonehouse summarizes, "Antarctic ecosystems, like those of the rest of the world, are already shifting, at variable rates, due to an undetermined range of natural factors in which shifts of climate may or may not be implicated." *Antarctica and Global Climatic Change* describes many of the uncertainties in measuring and modelling global climatic effects and provides a wealth of information on the atmosphere, ice conditions, oceanic interactions, geology, and ecology of Antarctica.

The book was written as a result of The United Kingdom and New Zealand 1990 Symposium on *Antarctica and Global Climatic Change.* Consequently the contributors are members of institutions in these nations. Thus, the focus may be biased somewhat, but the variety of topics covered, the continental range, and the breadth of references given would appear to compensate. *Antarctica and Global Climate Change* consists of 14 chapters divided into three parts: current state of knowledge; atmosphere, ice, and ocean; and ecology and management responses. Chapters deal with global climate models, Antarctic climate, Antarctic geology, the



Antarctic ice sheet, Antarctic ecosystems and their management, and strategies for mitigating impacts of climatic change. Most chapters end with a conclusion or discussion followed by references. The final chapter provides a list of about 250 recent references, most technical, but a number generalist and popular in nature.

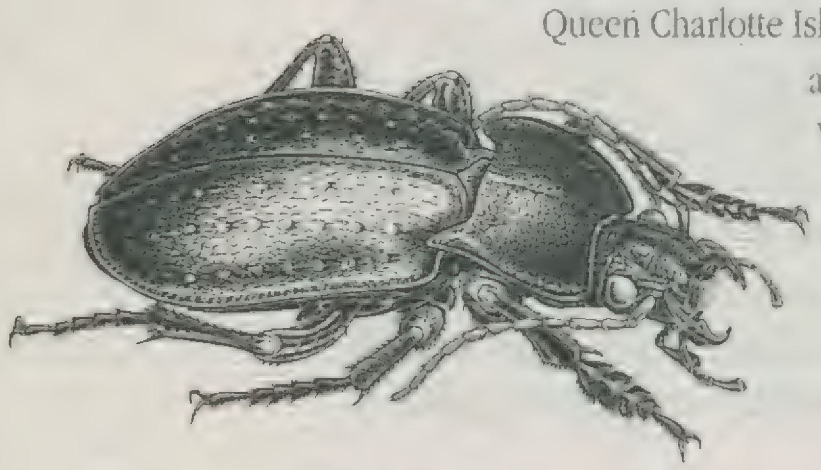
This book indicates that there will be a considerable time lag in Antarctic warming because of the large heat sink provided by the southern ocean and the great potential for heat uptake in the Antarctic atmosphere. Instead it is to the Arctic that we should look for early response to global warming. A book dealing with similar topics in the Arctic would be welcome to many, especially now that the Royal Society of Canada has established its Canadian Global Change Program.

Kathleen E. Conlan, Research Scientist,
Canadian Museum of Nature

Carabid beetles (Insecta: Coleoptera: Carabidae) of the Queen Charlotte Islands, British Columbia.

By David H. Kavanaugh. 1992. Memoirs of the California Academy of Sciences Number 16. California Academy of Sciences, San Francisco, California, USA, 113 pp., col. ill. Paper US$25.00. ISBN 0-940228-17-3.

At the peak of the last glacial age, about 16,000 years ago, most of Canada was covered by massive ice sheets. As the ice retreated, various species of plants and animals dispersed from nearby areas that had escaped glaciation and colonized the now ice-free areas. Such ice-free areas are termed "refugia." Two refugia, which played significant and well-known roles in the development of Canada's present biota, are 1) the continental area south of the ice sheets in what is now the conterminous or adjacent United States, and 2) an area of Alaska and the Yukon Territory that escaped glaciation and is known as Beringia. Other smaller, less significant areas have been suggested as glacial refugia but evidence supporting these proposals is often fragmentary and equivocal. The Queen Charlotte Islands, an archipelago located about 240 kilometres north of Vancouver Island, just off the north central British Columbia mainland, is one such area. This publication is the culmination of many years of field work on the Queen Charlotte Islands and subsequent data analysis. It reviews the island ground beetle fauna (Carabidae) in an outstanding manner. Each of the 62 species known from the islands is keyed and described, and aspects of its natural history are presented and discussed. However, this publication is much more than a faunal survey. Kavanaugh proceeds to conduct comprehensive analyses of species diversity, geographical distributions, habitat associations, biogeographic affinities, associations with man, the origin and development of the fauna, and the question of whether the islands served as a glacial refugium. Of special significance to this question is the occurrence of two endemic species of the carabid genus *Nebria* in the archipelago.



Carabus nemoralis of the order Coleoptera is the "common garden Carabid," one of the New World's first introductions from Europe. It is presumed to have been introduced from England well over 200 years ago.

Illustrations are plentiful and are highlighted by the inclusion of 27 excellent full-colour habitat photographs, which clearly show the biological richness and beauty of the islands. This work should serve as a model for those interested in conducting a regional biological survey—the systematics is sound, taxa are dealt with uniformly and with fine attention to detail, and above all, there is a definite analytical focus to the work. This publication deserves a place on the bookshelves of all naturalists interested in insects, islands, ice ages, and Canadian biodiversity.

Robert S. Anderson, Research Scientist,
Canadian Museum of Nature

A history and atlas of the fishes of the Antarctic Ocean

By Richard Gordon Miller. 1993. Forest Institute for Ocean and Mountain Studies, Carson City, Nevada. 792 pp., illus.

A Special Publication of the Forest Institute, this book is a "Contribution to International Geosphere and Biosphere Program of the International Council of Scientific Unions." It consists of two parts. Part 1 describes historical, physical, and zoogeographical aspects of the Antarctic Ocean, the history of ichthyology in the Antarctic Ocean, and the exploitation and conservation of the Antarctic fishery. Part 2 consists an Atlas of the fishes in which some 378 species are described. A special chapter by Dr. Philip A. Hastings reviews relationships of fishes of the perciform suborder Notothenioidei.

Although this book will be of primary interest to biologists wishing to have a good treatment on Antarctic fishes, it will interest all readers wishing to make, for example, comparisons with other groups in cold adaptation. Biologists interested in fishes of the Arctic Ocean will be envious of the recent comprehensive books available on Antarctic fishes. In addition to this fine contribution by Richard Miller, there are two other recent volumes: *Antarctic Fish Biology* by J.T. Eastman, 1993, Academic Press, and *Fishes of the Southern Ocean* edited by O. Gon and P.C. Heemstra, 1990, J.L.B. Smith Institute of South Africa. Although a similar degree of endemism in the fishes does not exist in the Arctic Ocean, one hopes that we may soon see at least one comparable treatment of the biodiversity of Arctic fishes.

J.S. Nelson, Department of Biology, University of Alberta, Edmonton, Alberta T6G 2E9 CANADA

Ecology, Economics, Ethics. The Broken Circle.

Edited by F. Herbert Bormann and Stephen R. Kellert.
1991. Yale University Press, New Haven and London.
xviii+233p. ISBN 0-300-04976-5. US$26.50.

The book is based on 12 lectures that were presented at the Yale University School of Forestry and Environmental Studies in the spring of 1989. Dealing to varying degrees with ecology, economics, and ethics, the contributions are divided into five major subject areas—species diversity and extinction, modern agriculture, environmental values, pollution and waste, and market mechanisms. The theme of the volume is that global environmental problems must be viewed in a broad interdisciplinary perspective, which recognizes the relationships or the interconnected circles among ecology, economics, and ethics before these problems can be solved. Currently, the circle is considered to be broken, because environmental policy is determined on short-term solutions.

In addition to the 12 papers, the authors have written a preface and some concluding remarks. As outlined in the preface, the individual papers deal with biodiversity, prosperity, and value; biological diversity and global security; the "management" of diversity; nature as the measure for a sustainable agriculture; the pesticides question; environmental values; the disposable society; ground water; pollution, politics, and communication relationships; tropical forests; incentives for conservation; and chemical prospecting. As one might expect in a book of this nature, coverage is mixed and uneven, with the contributions ranging from quantitative papers on waste disposal and pesticides to a philosophical essay on environment and ethics.

In the final chapter the editors attempt to close the circle by drawing on the writings of the 12 experts. In this regard they have done a rather masterful job. Kellert and Bormann conclude that their initial conviction remains apparent. They note,

"Our capacity to address global environmental problems will necessitate a better understanding of the environmental deficits that humans are inflicting on the planet, a recognition of the need to deal with these problems in ecological as well as economic terms, and a cognizance that an effective response will require a shift in our ethical terms of reference."

Significant environmental problems considered are toxins, ozone depletion, global warming, increasing acidification of rain, and species extinctions. A thorough understanding is a requisite to their solution. In addition, there is a necessity to curb human population growth, to reduce consumption of space and materials, and to make more efficient use of resources. The editors conclude that the necessary shift in ethical consciousness cannot be achieved unless humans develop a greater sense of humility, respect, and even awe toward nature.

J.H. Cayford, R.P.F., Editor, The Forestry Chronicle, Ottawa, Ontario, CANADA

Rain forest in your kitchen, the hidden connection between extinction and your supermarket.

By Martin Teitel, 1992. Island Press, Washington, D.C.
112 pp.,US $10.95 paperback, ISBN 1-55963-153-8.

The first sentence prefaces the book succinctly: *Eating, more than any other human activity, binds us to the world of nature.* Even more descriptive are Teitel's examples describing how our selections at the supermarket influence the relationship to the natural order in sustaining our own survival. If our eating habits are not altered, and our current preferences continue to stimulate the decline in the diversity of produce and other foods, a tremendous pressure will be placed on the factory-produced farms to harvest many plants out of existence in order to satisfy our monocultural choices.

Many case histories are cited showing the loss of biodiversity through a restricted gene pool, along with the alternatives to compensate and correct the situation before it becomes irreversible. As Teitel demonstrates, by diversifying our eating habits to include only items grown in season, expanding the market to include ethnic foods, and discouraging the "fast food restaurants" that cater to our convenience and comfortable predictability, we can maintain a sustainable future.

The last chapter, "Stepping Over the Threshold" concludes with a list of resources that provide ideas and materials to assist in spreading the word on preserving biodiversity with greater impact.

Truly, this book is a thought-provoking and eye-opening treatise, and it should be the guidebook in every kitchen.

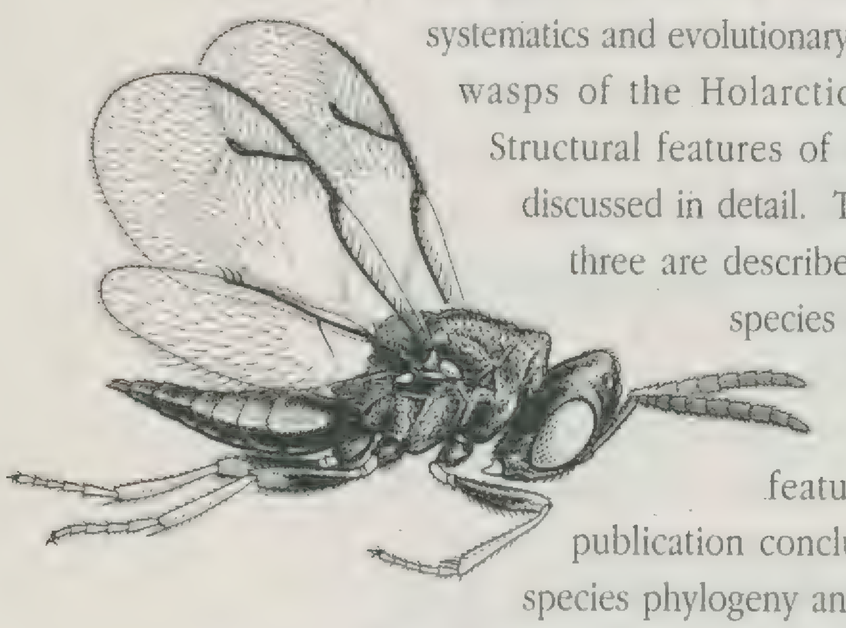
Susan A. Jarzen, Volunteer, Canadian Museum of Nature

Revision of the World Species of Spalangiopelta

(Hymenoptera: Chalcidoidea: Pteromalidae: Ceinae)

By D. Christopher Darling. 1991. Life Sciences
Contribution 155, Royal Ontario Museum, Toronto,
Ontario, Canada. 48 pp., ill. paper. $11.00.
ISBN 0-88854-395-6.

This publication is a technical treatment of the systematics and evolutionary history of minute parasitic wasps of the Holarctic genus *Spalangiopelta*. Structural features of the genus are given and discussed in detail. Ten species are recognized; three are described as new to science. All species are keyed and described in detail, and their characteristic structural features are illustrated. The publication concludes with a discussion of species phylogeny and biogeography. This is a well-executed piece of work but its appeal is destined to be limited to microhymenopterists.



This little Chalcid, at 4 mm, is one of the largest in its group. Chalcids are important "biocontrol agents" and the species illustrated is widespread in North America and the Orient. The species is a parasite of a wide range of caterpillars, particularly the imported "common cabbage worms," which become the adult "cabbage butterflies."

Issues

Underwood Publications, P.O. Box 489, Bayswater 3153,
Australia, Telephone (03) 764-5460. Subscription:
Australian $29.95.

As the title indicates, this Australian educational magazine deals with various issues. The August 1993 issue, Number 24, dealt with Australian indigenous people; the next issue will deal with ocean rescue. Contents in the August issue include: Who are the world's indigenous peoples?; Has Mabo turned the tide for justice?; A new partnership between aborigines and the mining industry; Aboriginal peoples and the criminal justice system; Improving aboriginal and Torres Strait islander health; Rights and claims of indigenous peoples; and Aboriginals in sport and tourism: Issues within aboriginal Australia.

The Mabo article discusses the recent High Court decision on aboriginal land claims by the Murray Islanders. Aboriginal title is a right to occupation based upon the prior occupation of the aboriginal people. It is a recognized form of title, a free simple estate and protects the title against trespass. The court overturned the application of *terra nullius* (unowned land) and the doctrine of discovery to Australia. For those peoples who have dwelt on their traditional lands and maintained traditional practices, it established that aboriginal title is recognized by the common law and that this title continued to exist after the British acquisition of sovereignty (though that could be extinguished by Commonwealth and regional government action). However, whenever members of an aboriginal nation were forcibly removed from their traditional land and, as a result, were prevented from adhering to traditional practices, the aboriginal title is extinguished. Also, the decision states that aboriginal people have no right to compensation for having their title extinguished by whatever means. While the High Court's decision has removed the legal basis for the continued dispossession of aboriginals who have retained traditional affiliations with their lands, it did not undo the justices of the past and it represents imposition of the newcomer's law on the First Peoples. [D.E.M.]

Biodiversity prospecting. Using genetic resources for sustainable development.

Published by World Resources Institute (WRI); Instituto
Nacional de Biodiversidad (INBio), Costa Rica Rainforest
Alliance; and African Centre for Technology Studies
(ACTS). May 1993. 341 pp. Paperback, ISBN 0-915825-89-9. US$29.95. Obtainable from: WRI Publications, P.O.
Box 4852, Hampden Station, Baltimore, Maryland, U.S.A.
21211, Tel.: (410) 516-6963.

This book has been received, and a review will be forthcoming in the next volume.

The role of creative monography in the biodiversity crisis

By Tod F. Stuessy. 1993. *Taxon* 42: 313-321.

The increasing size and activities of the human population have resulted in pressure on the survival of other life forms. In the face of extinction of many of these organisms, we need to learn as much about them as quickly as possible. One level of understanding can be achieved through monographic studies, which contain basic descriptive information about organisms and their distributions. Monographs also contain predictive classifications and usually, evolutionary and biogeographic hypotheses for use by systematic biologists and society in general. The current rate of disappearance of the world's biota suggests the need for increased levels of monographic activity. Funding for botanical monography in the United States, however, is declining, and fewer graduate students are being trained with these interests and skills. Large-scale monographic projects, with established workers and postdoctoral associates together focusing on large taxa (i.e., 50-100 species), are advocated as one solution to the problem. [Author's abstract].

Floristics in Latin America and the Caribbean: An evaluation of the numbers of plant collections and botanists.

By Victor M. Toledo and Victoria Sosa. 1993. *Taxon* 42: 355-364.

This paper evaluates the present size of plant collections and the number of botanists in the countries of Latin America and the Caribbean, the region with the highest plant diversity in the world. Statistics reveal that while collection density is adequate for Mexico, Central America, and the Caribbean, South America (with the exception of Chile and Argentina) is undercollected. While Argentina hosts the highest number of botanists, all other countries need more plant taxonomists to perform floristic inventories. The differences in absolute numbers of specimens and botanists between the three largest countries (Argentina, Brazil and Mexico) and the other countries in the area are remarkable, reflecting an imbalance in the development of local botanical science. [Authors' abstract].

Farming in nature's image: An ecological approach to agriculture

By Judith D. Soule and Jon K. Piper. 1992. Foreword by Wes Jackson. Island Press, Washington, D.C./Covelo, California. 286 pp. Paper ISBN 0-933280-88-2, Cloth ISBN 0-933280-89-0.

This excellent book begins with a clear exploration of the economic and ecological issues of modern industrial agriculture. Never better described are the resulting problems of soil erosion, depletion and chemicalization of water resources, increase in pest problems, contamination of workers and food from pesticides, and the loss of genetic diversity.

The authors believe that the concept of agriculture as an industry is the root of the serious economic instability and ecological problems that abound today. The solutions of the "industry" to limited production problems have now backfired into greater problems. For instance, the use of pesticides to control pests has led to new and resistant pests, water pollution, human poisoning, energy dependency, and high input expense.

Agricultural science became a profession in the late 1800s and aligned itself to industry. The goals of the new agriculture were productivity, profit, and minimal labour. However, the growth in productivity of agri-business was at the expense of farm income and the farmer's option to choose ecologically sound farming methods.

Expanding on an innovative idea first described in Wes Jackson's *New Roots for Agriculture*, now being researched at The Land Institute, Soule and Piper outline a model in which agriculture mimics or imitates the vegetative structures of natural communities to achieve sustainability. This means vegetation adapted to seasonal precipitation patterns, tight nutrient cycles, compatibility in resource use among species, soil preservation,and biological control of pests. The principles can be adapted to any region after exploring its physical conditions and natural vegetation. Models are given of warm deserts, temperate deciduous forests,and tropical forests.

The Land Institute concentrates on the North American prairie soils that supported large populations of grazers. After 100 years of monoculture, 50% of the topsoil's latent productivity has gone. The prairie could be a structural and functional model for perennial polyculture research and, in particular, for the development of perennial grain crops.

Four basic questions are thoroughly discussed in the text: 1) Can herbaceous perennials yield a seed crop as well as an annual crop? 2) Can a polyculture or perennial seed crop outyield the same crops grown in monoculture? 3) Can a perennial polyculture provide much of its own fertility? and 4) Can a perennial mixture successfully manage weeds, harmful insects, and plant pathogens with little or no human intervention? The answer is basically yes.

If we are to consider the health of the planet and a comfortable niche for our children and future generations, it is imperative that we move away from the profit motive in agri-business. We should farm in nature's image by joining agriculture and ecology rather than continuing to combine agriculture and industry. This may not be the only way to succeed, but the experiment will be an interesting one to follow.

Anne Cleary, a reprint from Cognition,
Canadian Organic Growers, Box 6408, Station J,
Ottawa, Ontario K2A 3Y6 CANADA

Cognition

Quarterly voice of Canadian Organic Growers, Box 6408, Station "J", Ottawa, Ontario K2A 3Y6, Canada. Tel./Fax: (613) 258-4045. ISSN 0227-0781. Annual subscription for 4 issues: $20.

Organic or natural farming is a healthy and growing industry in Canada and U.S.A. Eleven percent of farmers in Quebec use organic methods. Encouraged by the consumer's desire for chemical-free food, the industry has grown to $5 billion per year in the United States. *Cognition* serves to link those who wish to farm in an ecologically sustainable manner in Canada and to share information with them. The magazine is published by the Canadian Organic Growers (COG) whose activities include supporting sustainable farming methods for farmers, promoting a decentralized, regionally based food system, and educating food growers and consumers through demonstrations and information systems. COG also maintains a mail-service library for members.

The 50-page Spring 1993 issue of *Cognition* contains a variety of editorials, news, articles, and advertisements. A viewpoint from COG's President admonishes organic growers not to respond to pests and diseases through quick-fixes, even if the fix is reputedly organic. Crisis management represents a failure to work with nature, rather than against it. A news note reports that the Canadian Organic Advisory Board submitted Canadian Organic Certification Standards to Agriculture Canada in May 1992 and that Agriculture Canada is considering various options for regulations for organic production under the Canadian Agricultural Products Act. The Board was formally to establish itself and hold its first meeting in mid-April, but hoped-for funding from the Green Plan did not materialize. An editorial reminds readers that use of Bt, a naturally occurring bacterium used to control caterpillar pests, also kills other butterfly larvae, many of which are not pests. That is certainly a concern for the monarch butterfly which is suffering population declines for a variety of reasons.

Three "Opinion" articles discuss the issue of biotechnology. One article queries the need for biotechnology, especially innovations designed to prolong shelf life at the expense of nutritional qualities. The second article by a molecular biologist and organic grower discusses potential benefits of genetic engineering. The third article asks: do we need biotechnology, who has asked for it, who will benefit, the lack of labelling, risks and safeguards. A selected reading list is given at the end of the three opinions. Other articles discuss the heritage seed program designed to preserve plant and genetic resources, an eco-farm in New Brunswick, the global plight of soil, managing pests in the home vegetable garden, organic growing in Brazil and central British Columbia. A book review section, new product information, a conference listing, Third World news, Organic Network COG Chapter news, and a variety of advertisements provide a rich and varied fare for the reader.

Cognition is clearly written, informative and practical. It is heartily recommended to those who wish to enhance ecologically sustainable crop production on farms or in vegetable production in home gardens. Organic farming contributes to sustaining natural diversity because of its low input of toxic chemicals into the off-farm ecosystems as well as maintaining the health of soil and diversity of soil organisms on the farm. [D.E.M.]

A comparison of ungrazed and livestock-grazed rock vegetations in Curaçao

By Adolpho O. Debro and John A. de Freitas. 1993. *Biotropica* 25(3): 270-280.

Five of the largest remaining patches of livestock-inaccessible rock vegetation of Curaço, Netherlands

Antilles were described and compared to rock vegetation that has experienced centuries of livestock grazing. Study rocks (maximum diameters 24-47 metres[m]) were located at two sites differing in rock type and altitude. At the St. Christoffelberg site, study rocks were siliceous and at altitudes of 240-310 m while at the Tafelberg site the rocks were of limestone and at altitudes of 35-150 m.

The main species of vascular plants on livestock-inaccessible rocks at both sites was *Tillandsia flexuosa*, a bromeliad. At the St. Christoffelberg site, *Tillandsia* was principally accompanied by the grass *Paspalum secans*, the orchid *Brassavola nodosa*, and the herb *Portulaca venezuelensis*, while at the Tafelberg site, it was principally accompanied by the vine *Serjania curassavica*.

On livestock-accessible rocks *Tillandsia* ground cover was reduced to insignificant levels and mature plants were virtually eliminated from the population. Grazed vegetations were principally dominated by the annual grass *Aristida adscencionis* (St. Christoffelberg site only), the prickly pear *Opuntia wentiana* and the shrubby tree Acacia tortuosa. None of these weedy species, all of which are widely distributed on the island, were of any significance in ungrazed rock vegetation.

It is hypothesized that *Tillandsia*-dominated ground cover may have been a common feature of the rock vegetation of the island prior to the introduction of livestock. [Authors'abstract].

This study suggests that grazing may have significant effects on the biodiversity of natural vegetation. There are about 1.5 billion hectares of grazing land on the globe. Domesticated grazing stock include cows, zebu cattle, mithan, water buffalo, yak, sheep, goats, alpaca, Bactrian camel, dromedary, horse, donkey, guinea pigs, geese, and others. Environmental effects may be expected to be intense when grazing diminishes ground cover, reducing formation of humus and permitting erosion to set in; in turn those physical processes would be expected to reduce biodiversity.

But biodiversity of vegetation is probably affected before that level of grazing is achieved. The impacts of grazing may be focused when there is a single species of domestic stock. Each species grazes its preferred plant foods while distasteful species are avoided and hence, their survival is favoured. Grazing impacts may be intensified when the domestic stock has not evolved *in situ*, or even more when domestic stock is introduced into an environment where there were no native grazers. Other impacts of domestic stock on vegetation may include compaction of the soil by the hooves, breaking down of stream banks, and conversion of treed areas and shrubland to grassland. Or the livestock owners may clear forest and shrubs to increase grazing areas. Cattle are significant producers of methane, a gas which contributes to the greenhouse effect and climatic warming.

Various questions arise from contemplating these possibilities. What is the total impact, globally, of livestock grazing on vegetation? How many species have livestock driven to extinction? Are livestock numbers increasing globally? Are increases in livestock just as much a concern for plant diversity as increasing human populations? How can livestock management be modified so that its ecological impacts are minimal?

Of course, the effect of livestock is not limited to plant diversity. Livestock may also compete with or supplant various wild species, livestock managers may curb or kill off various wildlife as competitors to or predators of livestock, or exotic livestock may introduce diseases and parasites to wildlife. On the other hand, livestock may be relatively innocuous or have modest impacts when their numbers per unit area are low, or when they supplant other extirpated species with similar habits, *viz.* cattle and bison. Further, they may supply certain nutrients. All-in-all, the study of the impacts of domestic stock on biodiversity and their mitigation seems worthy of investigation [D.E.M.].

Amphipacifica

Royal B.C. Museum, Victoria, B.C. V8V 1X4 CANADA.
Fax: (604) 387-5360. Annual subscription for 4 issues:
Can$50, U.S.$40.

Amphipacifica is a new international journal of invertebrate systematics, aimed primarily at the publication of monographic treatments that are too large or bulky (35-100+ printed pages) for acceptance by regular taxonomic journals such as the one published by the Canadian Society of Zoology. In the first issue, the contents feature monographic studies on the crustaceans of the faunistically rich and geologically ancient North Pacific coastal region. Geographically, the scope of this new journal also extends to other Pacific regions. Faunistically, it extends to other arthropods, molluscs, annelids, and to other regional invertebrate taxa, both aquatic and terrestrial, including parasites, and to aspects of vertebrate animals that may involve invertebrates.

With a run of 300-400 copies per issue, the 200-225 page journal appears quarterly. Printed page size is 22 x 27.5 cm or 8.5 x 11 inches, and the paper quality will accommodate line cuts and half tones at 400-600 d.p.i. and a limited number of colour plates at author's cost. Manuscripts, which have previously been refereed and text-edited at the author's instigation, are to be submitted in "camera-ready" computerized format (IBM- or MAC-compatible diskettes) and hard copy. Suitability of manuscripts, based on content and adherence to submission regulations, will be decided by the Advisory Board of the new journal.

The cost of printing and mailing of each issue is defrayed by institutional and individual subscriptions to the journal and by page charges to the authors of $15.00 per printed page (including plates). For more detailed information, and a subscription form, please contact: Dr. E.L. Bousfield, Managing Editor. [Journal announcement]

Save our coral reefs

A coral reef care manual for the Philippines and neighbouring seas. By Don E. McAllister and Alejandro Ansula, with cartoons by Rox Lee and photos by Lynn Funkhouser. 1993. Ocean Voice International, 2883 Otterson Drive, Ottawa, Ontario K1V 7B2, Canada. 126 pp., 85 illus. Spiral bound, soft cover. ISBN 0-9695176-1-0. U.S.$20.00 + $2.50 surface mail postage or $5.00 airmail.

This educational manual provides a guide to the benefits of the healthy coral reefs in the seas of southeast Asia around the Philippines. It also describes how coral reefs function, what they need to stay healthy, what degrades coral reefs, and how you can protect and restore coral reefs. A resource section provides information on organizations and publications that can provide additional assistance. It is aimed at the layperson, especially those in coastal communities. Written with few technical terms, it uses numerous illustrations to help carry its message. Although the resource section of the book emphasizes the Philippine region, many of the messages in the rest of the book apply to other regions with coral reefs around the world. [Author's abstract].

Global marine biological diversity

A strategy for building conservation into decision making. Edited by Elliott A. Norse. A contribution to the Global Biodiversity Strategy. The Centre for Marine Conservation (1718 Connecticut Avenue, N.W., Suite 300, Washington, D.C.), World Conservation Union, World Wildlife Fund, The World Bank, United Nations Environment Programme. Published by Island Press, Washington, D.C., 350 pp., illus. Cloth: ISBN: 1-55963-255-0, US$50.00, Paper: ISBN 1-55963-256-9, US$27.50.

Oceans and seas cover 71% of the planet providing an immense living space for plants, animals and microorganisms, much larger than that on land. Life in the sea is more ancient and has a deeper variety with more phyla (the major classification groups just under kingdoms) than on land, even though land has more species. The ecological services provided by the oceans are vital for the survival of all life on earth. Ocean organisms produce oxygen, bank carbon, moderate climate, produce food, and many other services drawn upon by humans and other species. For these reasons alone, the publication of *Global marine biological diversity* is an important event. The other reason that this book is a major "seamark" is that ocean life has received marginal attention in the International Convention on Biological Diversity and in the major publications on biological diversity. (For those who haven't guessed, seamark is the marine equivalent of landmark—a plethora of words like landmark expresses the terrestrial bias of the human ethos, a bias that must be overcome if we are to fully appreciate, protect, and wisely use marine biodiversity.)

Global marine biological diversity contains nine chapters: Conserving the living sea; Marine biological diversity: Definition and importance [of biodiversity]; Marine and terrestrial conservation; Threats to marine biological diversity; Impediments to marine conservation; The goal and the strategy; Tools for conserving marine biological diversity; Existing marine institutions and instruments; Recommendations for implementing. Appendices list acronyms, institutions mentioned in the text, legal citations, endangered marine species. Literature cited, a glossary, and an index complete the book.

By using the case history approach, the book gives you a feeling of what is happening in the real world. For example, Chapter One starts with the story of the discovery, overhunting, and extinction of Steller's sea cow, *Hydrodamalis gigas*. Boxes are used to highlight

information such as biodiversity at deep-sea vents, marine extinctions, and oil spills. The reader learns that the oceans are richer in higher groups of animals such as phyla, though less rich in species than is the land. For example, the starfish, comb jelly, and lamp shell phyla are found only in the oceans.

The book pays attention to the existence and ecological functions of groups such as the sea worms that, despite their small size, play a significant role in ocean sediments and the food web. This is a welcome change to marine conservation approaches that overemphasize larger species such as whales. The role of ocean plankton and other marine organisms in capturing and storing carbon dioxide, a greenhouse gas, is explained. The value of marine resources for food and industry, aesthetic and recreational resources, and a source of scientific information are documented. Yet editor Norse declares that it is arrogant to think that only human life counts, that another ethic—one that recognizes the right and drive of other species to survive—is needed .

The chapter on conservation describes methods of evaluating areas for protection, including species hotspots, species of special concern or significance, the need to represent ecosystems and biogeographic areas, spawning and nursery areas, migration stopover points and bottlenecks. One learns that the selection of protected areas takes considerable thought and planning, and that destruction, simplification and fragmentation of habitat are just as important in the oceans as on land.

The chapter on threats discusses overharvesting, physical alteration, pollution, alien species, and global atmospheric change. Root causes are discussed as well as immediate causes. Root causes are: too many people, overconsumption, institutions degrading rather than preserving biodiversity, lack of knowledge, and the low human value placed on nature.

The text ends with a section entitled Recommendations for Implementing the Strategy and is organized under international, national, and local subheadings. Recommendations, amongst many others, include:

* the establishment of an International Marine Conservation Network;
* the development of ecotourism that shares socioeconomic benefits with local people and does not result in loss of biodiversity or cultural conflict;
* the holding of international symposia on fisheries and coastal development by FAO, the World Bank, and regional banks, which would examine the effects of subsidies and taxes, the sustainability of artisanal and commercial fisheries, wild and maricultural;
* the reversal of the steep decline in industrial nations for support of biosystematics research;
* the establishment of biodiversity curricula for all primary and secondary schools to increase awareness about biodiversity and the need for its conservation; and
* the modification of the charters and policies of international agencies and the texts of international treaties, agreements, and programs as necessary to affirm the rights of individuals and NGOs to participate in decisions affecting the environmental quality and the use of natural resources, including those of the sea.

This is a deep and thoughtful examination of marine biodiversity. It is clearly written, free of jargon, and contains an immense amount of information. The depth and breadth show the signs of the extensive consultation that the Centre for Marine Conservation undertook in reviewing the several drafts. The Centre for Marine Conservation, World Conservation Union (IUCN), World Wildlife Fund, United Nations Environment Programme, and The World Bank are to be congratulated for publishing this Strategy. It is most highly recommended: international, national, and local institutions should use the Strategy as a greenprint for action. [D.E.M.]

ERRATUM

The Managing Editor apologizes to Dr. Kris Pyrozynski for incorrectly transcribing some numerals in his book review of The biodiversity of microorganisms and invertebrates: Its role in sustainable agriculture (Volume 3, Number 3, p. 35). In the second paragraph, first column, the sentence regarding the number of fungi and insects in the world should read: Only about 69,000 of the estimated 1.5 *million* species of fungi, 800,000 of at least 6 *million* insects, only about 3% of 500,000 nematodes, and a similar proportion of bacteria and viruses have been described.

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indeed it's the only thing that ever has.

Margaret Mead, U.S. Anthropologist

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